



FRIDAY, DECEMBER 21.

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Contributions.

Car Lighting.

NEW YORK, Dec. 17, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Dec. 14 I notice a very intelligent article on Car Lighting, which may, with advantage, be supplemented in one or two points, as the subject is one of great interest to railroad managers. You say: "If cars are to be satisfactorily lighted by gas, they must have lamps which will give at once a very steady flame and a high degree of illumination in proportion to the amount of gas burned." These desiderata are so perfectly attained in the practical car lamps for burning Pintsch gas that I am surprised they are overlooked in so full a presentation of the subject as you have given. The new lamp of the Pintsch equipment is a four-flame lamp, each flame consuming five-eighths of a foot per hour. These four flames, burning altogether $2\frac{1}{2}$ cu. ft. of gas per hour, are found to have by photometric tests an illuminating power equal to 35 candles, measured without reflection. This lamp casts no shadow, does not in any way vitiate the air of the car, but on the contrary acts as a constant ventilator, carrying the impure air from the car, never flickers under any conditions, and is not disturbed by the most violent agitation of the air. The opening and closing of doors, windows or ventilators, in no way affects the lamp. No other form of regenerative lamp has ever been devised which has these qualities. A Pintsch gas light and other regenerative lights, tested side by side in the slight current generated by the waving of a fan, or even a sheet of paper in the hand, shows very remarkable differences. So far as the conditions you mentioned are concerned the Pintsch lamp leaves absolutely nothing to be desired, and I do not think I exceed the limits of strict truth in saying that it is the only practical gas lamp ever devised for cars.

In the concluding paragraph of the article I find the following: "One great bar to lighting cars by gas has always been the difficulty of carrying enough gas in cylinders under the car to supply them with a good light for a long journey. The cars had to be kept within daily reach of the gas works, thus forcing the roads either to light only special trains or multiply gas works." I do not think it will be claimed upon examination that the bar to the gas lighting of cars upon which you lay so much stress applies in any degree to Pintsch gas. A cylinder of 20 in. diameter and 8 ft. long will hold gas enough to run a car from New York to Chicago and back, with brilliant illumination, during all the time when light is required, and without the necessity for the least economy in burning it. It will then be found that gas enough remains to carry the car for a long distance on its western journey, but presumably the cylinder would be filled again at the terminal points, which would involve but one-eighth the cost of labor necessary to replenish the oil in its lamps. A private car, lighted with Pintsch gas, was out on the road nearly a month and had gas enough to light it home without replenishing its cylinder. It is a fair presumption that the gas was economized on this extraordinary trip, but not to the extent of depriving the tourists of sufficient illumination for comfort and pleasure. It cannot be said with truth that gas lighted cars need to be kept within daily reach of the gas works. Sources of supply 48 or 60 hours apart are quite near enough for practical purposes, and if the convenience of railroad management demands reservoirs of gas at intermediate points these can be provided in this country as they are on most of the roads of Europe, by means of tank cars into which the gas is pumped at the works, under high compression, to charge the small cylinders when necessary. It is no more trouble to transport gas 100 or even 1,000 miles in such a tank, than it is to transport petroleum in a tank car, and with no possible danger. It is the intention of the company controlling the Pintsch patents for this country to build gas works at all the principal railroad centres of the country, and in view of what experience has shown to be the practicability of long distance lighting without recharging the cylinders, a dozen gas works would supply illumination for all the railroad cars in the United States on roads of consequence.

It is a cause for surprise that the Pintsch lighting system is not better understood and appreciated in this country. In Europe it is almost universal. It has been extensively introduced in Germany, Austria, France, Russia, Italy, Holland, Belgium, Egypt and Great Britain, and now lights nearly, if not quite, 25,000 cars running on foreign railroads. In this country it is employed in illuminating the cars of the New York, Lake Erie & Western, the West Shore, the New York, Providence & Boston, the Chicago & Atlantic, the boats of the Providence & Stonington Steamship Co., and three of the lines of ferryboats crossing the Hudson River. In every instance it has been found superior to any other form of car illumination, and as much cheaper as it is better.

J. C. BAYLES.

The Westinghouse System of Pneumatic Interlocking.

Before entering into a description of the operation of this system, it will be necessary to describe the construction and operation of its several parts. There are a steam generating boiler, an air compressor, and a condensing tank through which the air must pass before entering the main air pipe. This deprives the air of any moisture which it may have had originally, or collected in passing through the heated cylinder of the compressor, and prevents its collecting in the valves or cylinders where it might interfere with their operation.

Each signal blade is connected directly to a pneumatic cylinder, the pressure to which is controlled by a small valve actuated by an electro-magnet which in turn is controlled by the operator in the cabin. The air supply to each of these cylinders is taken from a cylindrical tank at the bottom of the post, all of which are connected directly to the main air pipe; consequently, all signals have, at all times, the full pressure of the compressed air, right at their cylinder valves. The control of this pressure by the electric valve and the valves by the operator will be treated later.

From this same air pipe pressure is conducted to the switch valves, where it is stored in a reservoir, which forms the valve support, and is provided with a cap or plug with three ports formed in it, and a D-valve seated over them, exactly as is done in a steam engine. Encasing this D-valve and its ports, see fig. 4, A, is a hollow cap fastened to the reservoir and connected with it so that the full pressure from the reservoir is at all times in it, and consequently on top of the D-valve, holding it seated. One of these ports connects directly to the open air; this is the centre one, while the right and left ones connect each to one end of the cylinder operating the switch. This D-valve is so constructed that it is impossible to admit pressure to one of the ports before having connected the other with the exhaust. It is, therefore, very evident that it is impossible to have pressure on both sides at one time, and also that the full air pressure is always holding the switch in the position last moved to. With this description, it will be clear how the pressure can be changed to one end or the other of the switch cylinder.

The switch movement, fig. 5, consists of a long cylinder, $5\frac{1}{2}$ in. diameter, provided with two flanges for securing it to the ties, and two studs or trunnions on the opposite side forming pivots for an arm operating the lock and detector bar of the switch, a piston composed of a plunger packed at each end and formed into a rack between, engaging into a pinion which rotates about $\frac{3}{4}$ of a revolution to each movement of the rack piston. This pinion is keyed fast to a shaft on which a crank is formed, and turns with the pinion. To this crank the operating rod of the switch is connected, and also a link joining it to the rod already mentioned, operating the lock and detector bar. It will be noticed that this crank stands beyond the centre line of its axis continued through the centre of the switch connection, and that it might move a corresponding distance to the right of this centre line before giving any appreciable motion to the switch itself, on account of the small arc thus described. It is the peculiar arrangement of this crank that renders this movement so simple in effecting the motion of the detector bar and the preliminary unlocking of the switch and a final motion of the bar and locking of the switch after it has been moved. By reference to the cut it will be clearly seen that the movement, when normal, holds the switch locked in one of its two positions and the detector bar below rail level. Also that the first motion to take place is the simultaneous raising of the bar and unlocking of the switch. The lock bolt thus operated is of sufficient length to have been fully withdrawn from the hole in the lock rod of the switch before the motion of the crank is imparted to the rod moving the switch. It is also, for simplicity sake, allowed to travel still farther from the lock rod during half the motion of the switch, when it again approaches the rod, and by the time it arrives at the bar again the switch must have moved so as to bring the second hole in the lock rod opposite the pin before it will become locked, and indicate it in the cabin in a way to be yet described. On the casting forming a guide for the lock rod, directly in front of the locking pin, is placed a circuit-controlling device (fig. 5 A), which, when the lock pin has entered the lock rod of the switch, holds the circuit open, and when the pin is withdrawn permits it to become closed. The function of this device will be described later.

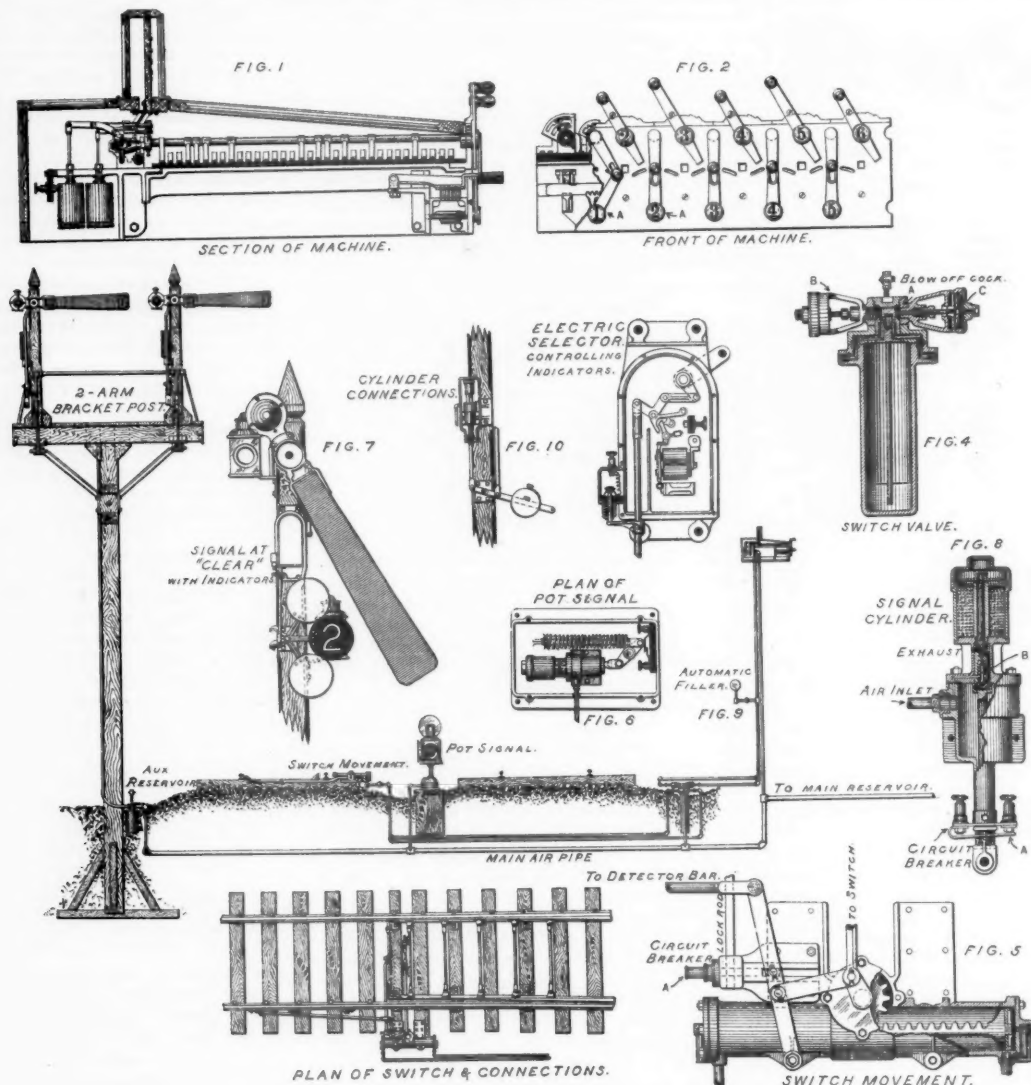
Having described the construction of the switch valve, we will explain the manner of operating it. On each side of the hollow chamber or cap encasing the D-valve, fig. 4, B, are two small cylinders containing pistons, and a stem from each extending through a stuffing-box into this cap or chamber and resting one against each end of the D-valve. Connected to the heads of these two cylinders are two small pipes which run directly into the cabin to the machine, where they run to the ports of a three-way cock operated by the switch lever, fig. 3, A. This cock is identical

in operation with the D-valve, in that but one port can have pressure on it at a time, the only difference in its construction being that its seat is cylindrical, or rather, conical, instead of flat on a horizontal plane, as is the D-valve. It is evident that pressure must be on one or the other of these small cylinders, fig. 4, B, at all times. It is also evident that since the D-valve is set between these pistons, any motion of them will be imparted to the valve also, and that the pressure on each piston acts against the other one through the valve, thus making the two pistons and the D-valve act as a solid plunger in a single cylinder. The D-valve is not in any way connected with the piston stems but simply guided between them, thus allowing compensation for wear on the seat and under face of valve. It is often desirable to throw two or more switches by the same lever as is the case with crossover or slip switch with movable frogs. In such cases, unless they be too far apart, but one valve is used, and each one of the two or three switch cylinders is connected directly to it in the same manner as is that of a single one. It is perhaps necessary to explain now the necessity of this valve being interposed between the cock at the machine and the switch cylinder, since it will be evident that the operation would be the same if the pipes from the machine went directly to the switch cylinder. While this is the case, still a serious feature in this arrangement prevents its adoption. Owing to the extremely long distance it is oftentimes found convenient to operate switches from the cabin with this system, and the consequent long line of pipe necessary to be filled with air and exhausted at every movement of the switch, it is found not only more economical in saving air, but very much more efficient in operation to place this valve as close to the switch or switches operated as possible, and fill the small pipes leading from the small cylinders of the valve to the machine with water in summer, and chloride of calcium, alcohol or some other non-freezing liquid in winter. When this is done and the air from the machine cock is admitted on top of it, it instantly acts against the pistons of the small cylinders of the switch valve, fig. 4, C, since the liquid will not compress, but acts as a solid rod. This would not be the case were the air used alone, since it would require some time to compress to the pressure necessary to move the valve, and waste a corresponding amount by connecting the opposite side to the exhaust. In order to compensate for loss of liquid by evaporation or leak, an automatic filler is attached to all hydraulic pipes, fig. 9, which, normally, is opened with all of them not having pressure on them, and automatically closed from them, by means of a check valve, when the pressure is admitted on top of the water in them. This insures a full supply of liquid in these pipes at all time and consequently a quick action of the switch valve.

The cylinder operating the signal will now be described. As before stated, this cylinder, fig. 8, has the pressure right at the valve controlling its admission to it. This is also controlled by an electro-magnet, the circuit of which is controlled by the operator through the machine. The piston of this cylinder is connected with the blade either directly or through a balance lever, fig. 10, and in its normal condition is in the upper end of the cylinder being held there by the counter-weight blade or balance lever. In this position of the piston the blade is in the horizontal or danger position, and can only be moved from that position by the admission of air on top of the piston, thus depressing it sufficient to give the blade the proper angle (60°) indicating safety or caution, according to the nature of the signal. This is accomplished by a small pin valve, fig. 8, B, which normally holds the pressure closed from the cylinder, and the cylinder open to the exhaust. When operated by the electro-magnet becoming charged from a current sent through it by the operator, the reverse condition takes place, i. e., the pressure is admitted to the cylinder on top of the piston, and the exhaust is closed completely. The pressure thus confined depresses the piston and operates the blade. The instant the current is broken on the magnet the armature is released and the air again unseats the valve, closing the exhaust, and again cuts off the pressure, thus allowing the counter-weight signal to return to danger. This cylinder is also provided with a circuit breaker controlling the current to an electric lock to the lever operating it, fig. 8, A. The construction of this lock will be described with the machine, later. This current is closed only when the signal is in its danger position, and open at all other times, and since the lock releases the lever only when the current is on it, it is evident that the lever is unlocked only when the signal is in the danger position. Consequently when the signal is cleared the lever operating it is automatically locked, and should the signal fail to go to danger after the circuit has been broken by the lever controlling it, that lever will remain locked electrically, and hold all switches locked mechanically over which that signal gives right of way, until it does return to danger.

The small pot, or drilling signal, fig. 6, consists simply of one of the same cylinders as are used to operate the semaphore signals, placed horizontally in a cast iron box or case and connected to an arm keyed fast to a vertical shaft to which the signal target and lamp are secured. When operated, the cylinder turns this shaft one-quarter of a revolution, thus changing the target or light. The opposite side of this arm is extended, and connected to a long spiral spring, which returns the signal to danger when the cylinder is discharged.

When it is desired to operate indicators in connection with the signal, a device is provided in a well covered box, fig. 11, fastened directly under the signal blade and operated by it. This apparatus is provided with a pair of electro-magnets for each indicator rod, and a simple means of throwing one or the other of these rods into engagement with the signal, by them, so that it will be operated rigidly thereby. The



THE WESTINGHOUSE SYSTEM OF PNEUMATIC INTERLOCKING.

number or letter, fig. 7, displayed when the signal is cleared indicates to what track the switches are set. This system of signaling is of advantage in yards where a great deal of drilling is done, on account of its simplicity in construction and operation, the small number of lamps employed and the ease with which they can be read. When the signal is at danger the indicators are obscured by a screen which lies in front of them.

It is necessary here to explain that all levers controlling signals (fig. 2, A) when thrown out of their normal (vertical) position, i. e., to the right or left, effect the locking of switches during the first part of their stroke, and close the circuit on the signal at the end of the stroke. After the electric locking takes place, when a signal has been cleared by the signal lever being thrown completely to the right or left, it is possible to throw the lever sufficiently far normal again to break the circuit to the signal, but not far enough to release the locking to the switches; in this way the signal must go to danger before the switch levers can be released. The great advantage of this lies in the fact that should a signal stick at safety it indirectly locks all switches which require shifting in order to set a signal for a route conflicting with it. It is therefore impossible to give two conflicting signals at any time, by mistake or improper working of the signals.

The interlocking between levers of the machine is confined to that between switch and signal levers only, and never (unless ordered so) between switch levers themselves. Signal levers are interlocked between each other through the switch levers, as will be described next.

Figs. 1, 2 and 3 will make clear the general construction of the machine, and it is only necessary to explain that the framing is cast iron, the levers, valves, locks, etc., brass, and the top plate of hard rubber, as are the rollers lying horizontally over it. Each switch lever consists of a small brass lever keyed at the centre to a steel shaft which extends through a bearing formed in the front of the machine, a hard rubber roller lying horizontally over the top plate, and terminates in the three-way cock in the rear of the machine, with which it is fastened rigidly. The upper end of this lever is provided with a rubber handle, and the lever end extends down far enough to just clear a dog or latch (fig. 1, A) pivoted loosely under the machine and extending through its front directly under the lever. These latches perform the locking of the switch levers by the signal levers. In the normal condition of all signal levers, all of these latches lie in a notch cut in the locking bars (fig. 2, B) in front of the machine, and offer no obstruction to the movement of the switch levers; but the instant a signal lever is moved from its normal position the latches of all switches affected by it will be raised so as to cause the ends of the switch levers to strike them and prevent them being moved far enough to open the valves operating the switches.

The rubber rollers referred to as forming part of the switch and signal lever spindles are cast rigidly thereto and provided with a series of metallic strips or collars (fig. 3, B), extending part way around them, their ends terminating each in one of the six slots cut the full length of the roller parallel with its axis. These strips are not all put on in the same relative position with the centre line of the operating lever, but are staggered, so as to either make or break their contact with the upright ends of the strips (fig. 3, C) on the rubber plate running parallel with and directly under them. When the roller is rotated by movement of the switch lever. To one end of each of these strips on the rubber plate the controlling wires to the various signals run and the other ends are joined together and run to one common battery supplying all signals. The other pole of this battery is connected to the main air pipe, which is used as a common return for all circuits. The breaks in each one of these strips are controlled by the levers operating switches over which the signal thus controlled gives right of way; and also by one or more signal levers as the interlocking may require. It will be very apparent that before the current to any signal can be established, all breaks in the strip carrying its current must be closed by the bands or collars on the rollers making contact between them. This is done by placing the levers in a position to properly set all switches for that signal. It will be also evident that in having moved a switch lever to close the strip for one signal, it will at the same time break the circuit at a strip controlling another signal requiring that switch in its original position. In this way, a very simple and effectual interlocking between signals is accomplished.

The strips on the rollers are so arranged that they make contact between the upright strips only when the levers are in their extreme positions, one way or the other. In order never to be able to move a switch lever from one side to the extreme stroke on the other side, and thereby close the circuit for another signal requiring that switch reversed, without any certain knowledge that the switch has moved, a device is attached to the rear end of the roller, which consists of a quadrant (fig. 3, D) secured to the roller by a set screw, and having cut through it above the roller a radial slot through which projects horizontally a peculiarly-shaped locking lever, provided with a small latch or tongue pivoted near its centre, and capable of a horizontal movement right and left on its pivot, but held in a central position, parallel with the lever on which it is pivoted, by a flat spring on each side. This latch, like the lever, extends through the slot in the quadrant and ends flush with the end of the lever. The lever with the latch thus arranged is pivoted in a suitable bracket fast to the machine, and connected at its far end with the armature of an electro-magnet (fig. 3, E), the circuit to which is controlled directly by the lock pin of the

switch movement. This circuit is normally open, i. e., when the switch is locked, and closed during its operation. The armature of the magnet, therefore, normally, hangs by gravity away from the magnet and keeps the end of the lever, projecting through the quadrant, elevated, so that a small steel pin in the centre of the upper inside slot of this quadrant, when the switch lever is thrown beyond the vertical position, strikes the latch or tongue and carries its free end with it as far as its construction will permit; the lever then will have been moved sufficiently far to have operated the valve, and consequently moved the switch, but not far enough to have made the contact between the strips controlling the signal. Before this is possible the switch must have been unlocked, moved, and then locked in the other position. The unlocking of the switch closes the circuit on the magnet, which becoming charged depresses the end of the lever projecting through the quadrant, into a recessed portion of the radial slot, holding the switch lever still locked thereby. At the same time, the small latch or tongue being thrown below the small pin which had carried it out of its central position, flies back, under the pin, into its central position on the other side of the pin. The latch and lever assume this position as long as the switch remains unlocked, but on being locked in the position moved to by the lever being reversed, the circuit is broken on the magnet and the quadrant end of the locking lever is raised from the recess in the quadrant and the lever thus unlocked is free to be moved to the end of its stroke, when the signal circuit becomes closed. Thus the closing of the signal circuit depends directly on, not only the movement of the switch, but the locking of it after it has moved. The electric locking of signal levers is effected by a similar, but simpler device, which consists of an electro-magnet whose armature, like that of the indication magnet, is connected to a horizontal lever fig. 3, F, pivoted in its centre, and its far end projecting through a locking quadrant fast to the roller, and engaging in such a manner as to lock it from being moved out of its centre position, if normal, or from being put normal, and thus release the switcher locked by it, if out of its centre position, when the current to the magnet is broken through the circuit breaker of the signal controlled by that lever being at safety.

Directly above the machine is placed a miniature model of the tracks operated, fig. 3, G, and small movable switches thereon are connected directly to the rubber roller, so that after the indication from the switches is received, and the roller turned as far as possible, these small switches assume the position of the corresponding ones on the ground. In this way the operator can, at a glance, see the condition of his tracks at any time. In order to prevent an operator by mistake throwing his signal back to danger, and then his signal lever normal, and finally a switch, thus released, under or in front of a passing train, an interlocking relay, fig. 3, H, is

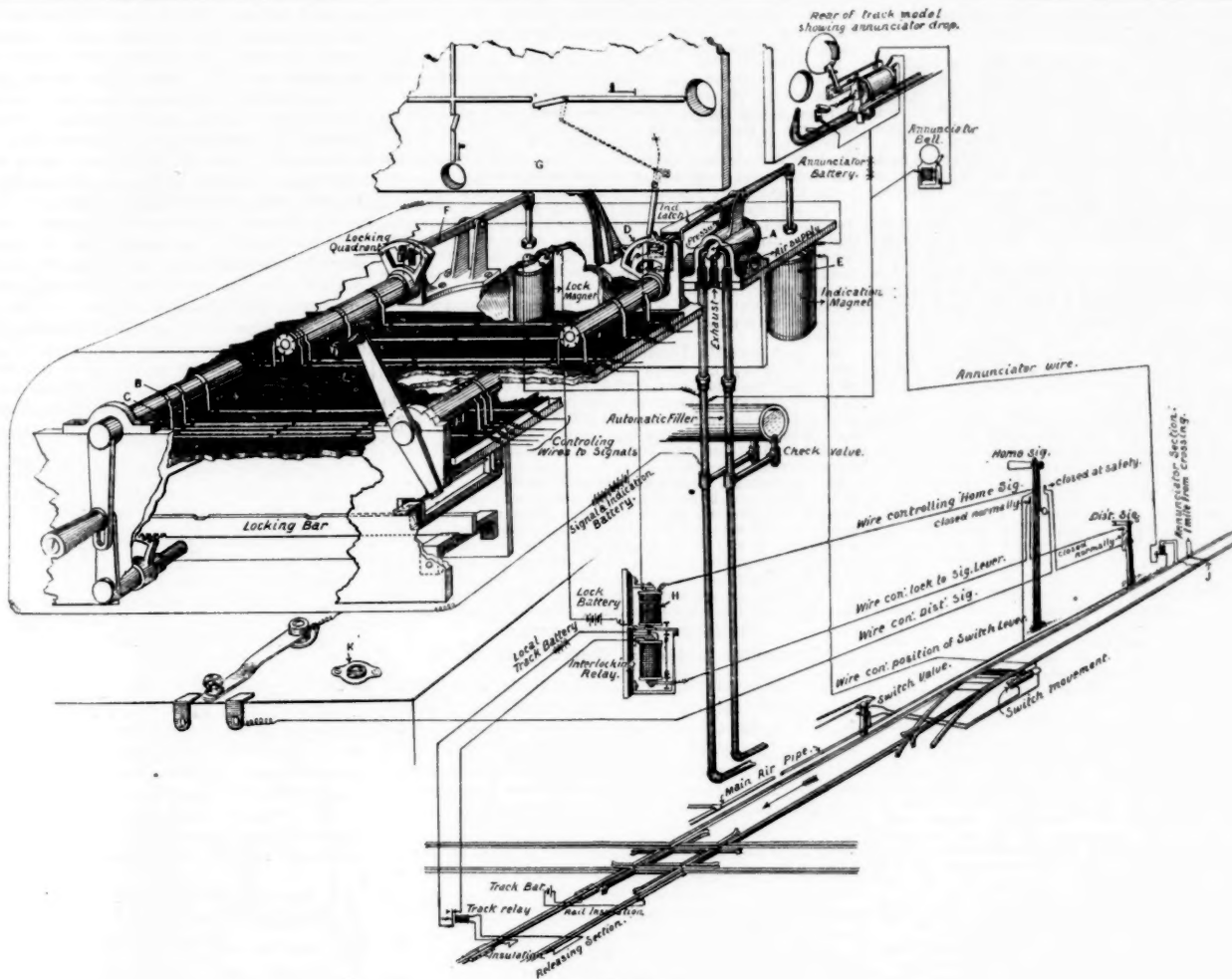


Fig. 3.

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included in the controlling signal and locking circuits, which, after the operator gives the signal, places the lever thus locked out of his control, in so much that while he has the power to throw the signal to danger at any time, it is not in his power to throw it normal and release the switches until the train has passed over the route set for it and cleared the last point of danger.

When within about one mile of the crossing, junction, yard, or of whatever the tracks interlocked consist, an approaching train automatically drops an annunciator on the rear of the track model, so as to display through an opening in the model board, fig. 3, I, a number or letter designating the track on which the train is approaching. At the same time, a bell begins to ring, and continues to do so until the train has passed over the short insulated section provided for that purpose, fig. 3, J. These drops are restored to their normal (obscure) position by a blast of air controlled by a small valve, fig. 3, K, in the front board of the machine, by the operator.

The advantages this system possesses over all others are numerous. Space required is limited, thus reducing size, and therefore cost of towers. The work is light, consequently female operators can be employed, thus reducing expenses. It gives great facilities for special locks. Large yards can be worked from one tower, as distance is of little object, switches half a mile away working as well as those close to the tower. There is no danger of signals being left at safety, as the machine remains locked until the signal has returned to danger. Any number of switches can, if necessary, be worked from one lever.

The following table shows the plants now in service:

Pneumatic Interlocking Systems in Operation.

Levers.	Location.	Railroads.	Put in service.
6.....	Bound Brook, N. J.	Phl. & Read, and L. V.	1884.
6.....	Brightwood, Ind.	I. V. and C. C. & I.	1884.
12 new style.	Wilkesburg, Pa.	Pennsylvania.	1884.
12 " "	East Liberty, Pa.	Pennsylvania.	1884.
6 " "	Valparaiso, Ind.	Chic. & Grand Trunk, P. F. W. & C. and N. Y. C. & St. L.	1884.
12 old style.	Stock Yards, Chi.	C. B. & Q. and Stock Yard R. R.	1884.
14 " "	Erie, Pa.	L. S. & M. S. and Pitts. & Erie.	1884.
21 " "	Oakland, Cal.	S. Pac. R. R. Tower No. 1	1885.
10 " "	" "	" " " No. 2	1885.
6 " "	" "	" " " No. 3	1885.
24 new style.	" "	" " " " for " No. 1 shipped Dec. 8.	1888.
21 new style.	17th st. Pitts. Yd.	Pennsylvania.	May 6, 1888.
"24 " "	14th st. "	Pennsylvania.	Aug. 19, 1888.

* At the 14th St. Pittsburgh Yard tower, the highest number of movements in 24 hours is 1,500, and the highest number of movements in one hour is 80. The machine is operated by one man.

Railroad Shops—New England Railroad Club.

At the meeting of Wednesday evening, Dec. 12, 1888, President Lauder occupied the chair, and announced as the subject for discussion, "The Arrangements of Shops and Machinery for the Construction and Repair of Railroad Rolling Stock," and that Mr. Marden would open the subject.

Mr. MARDEN: A railroad company can buy rolling stock at various shops that are established and run for the purpose, but it is more difficult to have the repairs of the cars and locomotive made at such shops, and it is economy for any road to provide good shops for the repairs at least of its rolling stock. I also believe that a road could build its cars, and I don't know but it could its locomotives, nearly if not quite as cheap as they can be built at most contract shops; and I know the road would be as well satisfied with the cars it built in its own shops. I say as cheap, meaning of course if they have equal facilities, and shops and machinery arranged conveniently, from the fact that the principal part of the expense of a car is in the material, the labor performed being but a very small part of it. The arrangements of the shops must depend largely upon the land that the company may own to place them on. Different plots of land would require different locations of shops, and while the round-house plan might be suitable for one plot of land, shops on either side of a turn-table might be better for another plot of land. There are advocates both for the round-house plan, and also shops located on either side of the transfer table, for the repairs of cars. At one time I thought that the round-house plan would be very much the best, especially for repairs of cars, but after looking the matter over carefully I have changed my mind, and I believe that if the land is suitable, that shops for repairs or for construction of cars are quite as convenient, and perhaps more so, arranged with a transfer table.

Among the most important things to consider in car shops is the width. I think the mistake has been made by many in making the shops too narrow, and also in making them too small—that is, the entire number of shops too small, building them for present use instead of looking forward to the increase of the business. I don't think shops should be made less than 100 ft. wide. The length, if they are built with a transfer table between them, or one side of them, may be optional, whatever length may be desired, to take care of the amount of rolling stock there may be.

There is another consideration which has been overlooked to a large extent, and that is light. I would have the largest amount of glass practicable in the shop; I would have all the daylight possible let into it consistent with the strength of the buildings, for I believe daylight is a good deal cheaper than any other light we can use.

In the arrangement of tools, especially in the wood-working shop, I think a building that is perhaps 50 to 60 ft. wide or more, and sufficiently long to do the work, is better than a square building. I would make it fully as long as required for the work, and then I would arrange the wood-working machinery so that the lumber as it came into one end would pass continuously down through the shop to the different machines until it was ready to go into the car, and from there pass by the shortest route to the place where it is to be used in the car. The machinery for the lighter work could be arranged as thought best, but I would have the machines that are intended to get out the frame part of the car so arranged that there would be no backward travel for the lumber. In the matter of machinery, I think that a road could almost afford to throw away its machines once in five or six years and buy new machinery, on account of the improvements made in it. I think it is a mistaken idea that we must run a machine until it has run out before we can buy a new one, especially if there are new machines that will do twice or three times as much work as the old ones.

I don't know as I can do better than to call your attention

to the plan of the shops that our road is building now at East Fitchburg, as it will show you my idea more clearly of what I think we ought to have for shops on the Fitchburg road, on the plot of land that we have assigned to that purpose, a level plot on the side of our main tracks running towards Fitchburg. The shops are designed to be four in number, that is, the working and repair shop, with a transfer table between the freight repair and freight erection shop, and one between the passenger and paint shop, with a suitable number of tracks in each shop; in this instance we have 24, by which we can either put the cars into the shop or on to the transfer table. The lumber will come in at one end of the shop and will pass on from one machine to another, and when it goes out will be ready for the erection of freight cars, and will be taken to the various shops where it is to be set up. There will be a covered passageway from the second story of this shop into the passenger erection shop. At the end we have our dryhouses. [Mr. Marden further explained the plan, pointing out the location of the upholstery and furniture room, the arrangement of the transfer tables, etc.]

We have carefully studied the subject of flooring in connection with our shops, and have finally concluded that a concrete floor will be, perhaps, best for the paint shop, and all other shops except the blacksmith's, and for that plank for the under floor, either yellow pine or spruce, with about one and one-eighth inch of yellow pine floor on top of that. Our idea is that if the top board should wear a half or three-eighths of an inch, or to such a depth as would require its removal, it would be easier to remove the thin flooring than to take up the planking, and much cheaper for the company.

The PRESIDENT: There is one very important matter I would like to hear discussed; that is, the size of the building and the location of the machinery in it; I mean in the building where the wood-working machinery is placed. Mr. Marden suggests a long, narrow building. I suppose that he would run cross shafting from the main line, and have his machinery set lengthwise of the shop. My own idea is that it would be better to widen that shop to a 100 ft., and let one line of shafting run through the shop, and put the machinery crosswise of the shop. I presume there are gentlemen present who have had experience in that direction, who could tell us just the most convenient way for getting out lumber for the construction of railroad cars. It seems to me that by putting the machinery crosswise it could be so arranged that the lumber could start at one end, and pass back and forth through these machines much more conveniently than it could if the machinery were placed lengthwise of the shop. Mr. Adams has some very good shops at Allston, built late enough to be modern, and I would like to have his ideas about the location of machinery.

Mr. ADAMS: As the President suggests, we have some shops that are tolerably well fitted, or were at the time they were built, for the wants of the road, more so than they are just at present. In regard to the location of machinery, whether it should be lengthwise or crosswise of the shop, that depends almost entirely on the circumstances and conditions which prevail. If I could arrange a shop with everything else equally as convenient, and at as small an expense, I think I should prefer my machinery to be placed crosswise in the shop, and principally for the reason that you get along in that manner with one line of shafting through the centre of the shop. I think it depends a good deal upon other conditions, upon the manner in which you get your lumber into the building, and the manner in which you get it out and into the erecting shops, and other considerations, so that it is a very difficult thing to plan a shop for one road just like one for some other road. As our shops were situated, it was necessary to make a continuous line of long shops; they are too narrow, but when they were built cars were much shorter than they are now, and we could build two freight cars on our track in our freight erecting shop, while now we can build but one. A passenger car 45 ft. long was a long car

12 years ago; now we are building them 50, 60 and even 85 ft. long, the demands being different from what they were at the time the shops were built.

The objection to placing the machinery crosswise might be raised that it would obstruct the passages, that it might be difficult to pass through the piles of lumber and other things. If you have a long shop with tracks running lengthwise, you are subjected to moving the cars two or three times where you would have to move them but once if they were crosswise; for instance, if you want to get out a car at the back end, you may have to get others out of the way first in order to move it, where the tracks run lengthwise; if they run crosswise you save the labor of handling so many cars.

The matter of a round-house for repairs has been mentioned. There are a good many advantages in a round-house, as well as some disadvantages. In my present view of the matter, I don't think I should favor the round-house either for building or repairs; but others who have had more experience with the round-house than I have can speak on this point better than I can. A strong objection to turn-tables in this region is that the pits fill up with snow and ice in the winter, and unless they are carefully drained it requires much labor to keep them clear so that the table will be practically useless. The less turn-tables you have round your shops the better, in my judgment.

Mr. Marden spoke of the matter of light. That is a thing of much importance, and also one very much neglected. I have never seen a shop really light enough to work in without a good deal of shadow all the time and dark places, which ought to be and might be avoided to a very great extent. A skylight in a shop, if properly arranged, affords perhaps as good a light as can be secured. I would have the walls as light as I could, and the windows as large and high as possible, and would have an abundance of skylight. I would have for an erecting shop a one-story building, with a very large skylight the whole length of it. A paint shop perhaps needs as much light as any other shop. There is but very little time in our paint shop when we don't have to burn gas, except perhaps in the longest days in summer, and then in the middle of the shop it is so dark between the cars that extra light is required. I have seen a good many shops that were almost absolutely spoiled by want of light enough to do the work; this might have been remedied by proper construction.

I agree with Mr. Marden that the machinery used in the shops should be of the most improved kind. I think it would pay most railroad companies who put their machinery in 10 or 15 years ago to throw it away and replace it by new. The improvements in machinery have been so great in the last five or eight years that it not only performs many more kinds of work, but does it a great deal better and cheaper than formerly. The use of old machinery by the railroad companies is one of the difficulties they labor under in their competition with the contract shops. I don't know why the roads cannot buy their materials as cheaply as the contractor, and if they made their cars themselves they would last from a third to a half longer than those made at the contract shops, and would require very much less repair.

The PRESIDENT: In talking with railroad mechanics, I find those who have used the roundhouse plan speak well of it; they say it is a good plan for a freight car repair shop. Now, theoretically, I think it is, but things don't always work as well in practice as they do in theory. We propose to build some shops and we have the plans partly completed similar to those outlined by Mr. Marden, as far as the paint shop, passenger car and freight car shops are concerned. We have in consideration plans for locomotive construction and repairs. The matter of arrangement of tools and machinery in a shop I think is of great importance. The handling of lumber is one of the chief items of expense in constructing freight cars, and if the machinery is arranged properly that handling can be reduced to a minimum; if badly arranged, the expense will be much increased, and the result appears in the additional cost of the freight car.

Mr. ADAMS: The matter of shafting is a point in which almost everybody years ago made a mistake by getting the shafting altogether too small; I don't know of a shop in the country built 10 or 15 years ago that has not the shafting about one-quarter smaller than it ought to be. Another point is getting the bearings too short. I had rather have my shafting heavier than necessary than not heavy enough, and I would have my bearings long enough, so as not to have any hot boxes.

Mr. GRIGGS, of the Providence & Worcester, placed upon the side of the room a very large diagram showing the construction and arrangement of the car shops of that road, concerning which the President remarked that he had visited them, and they were better finished and better arranged than any other shops in New England. Mr. Griggs explained the diagram at length, showing that the shafting of the wood-working machinery runs crosswise; that a track runs from the repair shop through the wood-working machine shop to the rear of the back yard; that there are five tracks back of the shop, so that the lumber could be taken away at any point and readily brought to the planer, the saw, and the mortising and tenoning machines, and many other details which he pointed out on the diagram.

The PRESIDENT: The last time I was in Pullman they said the great mistake in their shops was in not having the line of shafting underneath the floor and a belt up through for their machinery.

Mr. ADAMS: That has advantages and disadvantages. I think I should differ on that point. I don't think I should put my shafting under a wood mill. Mr. WHITNEY and Mr. GRIGGS rather favored shafting under the floor.

Mr. MARDEN: I can readily see that placing the belting under the floor of a car shop would depend much on the location as well as the plan of the building. If you have a cellar under your car shop or machine shop it must be well drained and dry. We have at one point in our road a mill with a cellar under it, and about two or three times a year we are likely to get a flood that will wet our belts all over, and it is some little time after that before we are in good working order again.

If the shops on our road are not large enough they will not blame any one but me. After I had laid out the plan for erecting the shop 450 ft. long the engineer said he thought we had better make them 480. So we have not been hampered in that way; the officers of the road insist upon having the shops large enough to take care of the work in the future.

Mr. COLEMAN: In handling timber in car shops the belts interfere with swinging round a long piece, and an underneath arrangement of the shafting seems to me desirable. At the Corliss Works in Providence their shafting is all underneath; it is perfectly accessible, so that a man can oil it easily. That is considered a model shop in every respect for the purpose for which it was designed. Another advantage in putting it below is that the basement is the most solid and strongest part of the building. I think it a necessity that these large shops should be lighted in the centre; but I am told that if the skylight is inclined, although it may afford a better light it will always be leaking.

Mr. WHITNEY: We have inclined skylights in our shops which were put on 15 or 16 years ago, and they make no trouble by leaking, although we had some put on within a year or two that did leak. If they are properly put on there is no trouble in getting them tight.

Professor LANZA, of the Institute of Technology: We

have had some sad experience in that matter. We have had our shops lighted with inclined skylights and they have caused trouble by leakage.

Mr. GRIGGS: Our machine shops and car shops were heated by overhead heat, to which I objected from the start. With 60 or 70 pounds of steam on, the shop was not warmed so that the men could take their coats off. At the same time it warped up the three-inch plank on the roof and split the slates off, and last year we took it down as a failure. The heat did not come down into the mill, it all went to the top, and I don't want any more overhead heating.

The PRESIDENT: I remember we employed an architect to design and construct a fancy railroad station, and when it was finished a few of us went down to inspect it. The radiators were about 8 ft. up on the wall. After experimenting for a while, the result was we had to take them down and put them on the floor. In opposition to that, I was discussing our new shops with Mr. Borden, one of our directors, a millman of Fall River, who was as enthusiastic and positive that the overhead system of heating was the right thing as he could be.

Mr. MARDEN: Mr. Whitney stated that he had good success in lighting his shops with inclined skylights. I don't understand the method of keeping them tight.

Mr. WHITNEY: The glass is put in in the ordinary way, mastic to lay; the sashes are good and firm, the glass is good, and carefully laid, and they have never given us any trouble, and I think it is better to have a skylight fitted at an angle than otherwise.

Mr. COLEMAN: I saw a paper mill made from a section of the Exhibition building in Brussels, that had a roof of shingles of glass, the whole roof was glass, and in a bright sunny day it was an exceedingly light shop, and a very warm one; it was as light inside as outside the building.

The President announced that the subject of discussion for the next meeting would be, "The Metric System of Weights and Measures as applied to Railway Service," and stated that the subject would be opened by Mr. George Richards.

Commerce of the St. Mary's Falls Canal.

The following are the statistics of the commerce passing Saint Mary's Falls Canal during the season of 1888, just closed, including a comparative statement of the same for the seasons of 1887 and 1888, and an estimate of its value for 1888, based on the unit prices heretofore used in similar estimates, because these afford a better basis of comparison than prices amended to conform to those actually prevailing.

The canal was open to navigation 212 days during the season just closed, or 8 days less than in 1887. The first vessel passed through on May 7, and the last one on Dec. 4. It will be observed that whilst there was a decrease of 1552 in the number of vessels of all kinds, registered and unregistered, there was an increase of 233,001 tons in the registered tonnage, indicating an increase of 37 per cent. in the average size of the vessels used, a condition decidedly favorably to the canal, since it is the number, rather than the size of vessels which limits the amount of business that the canal is capable of providing for. The number of registered vessels through the canal in 1887 was 8,530, and their average tonnage was 574.2, and in 1888 their number was 7,314, with an average tonnage of 703. Therefore, while the number of registered vessels was 216 less in 1888 than in 1887, their average tonnage was 128.8 tons, or 22.4 per cent., greater.

The average cargo carried by all vessels, registered and unregistered, in 1887 was 587.3 tons, and in 1888 was 821.7 tons, an increase of 40 per cent. The average cargo of registered vessels in 1887 was 644 tons, and in 1888 was 876.6 tons, an increase of 36 per cent.

The number of passengers carried through the canal was 1,110, or 22 per cent. less than in 1887. This is probably due to the completion of three railroads to Sault Ste. Marie.

The great reduction in the wheat traffic is accounted for by the short crop of merchantable wheat, the increased shipments of flour (the output of the Minneapolis mills), and the abnormal fluctuations in the price of wheat during the month of October.

Although the percentage of increase in the freight tonnage is somewhat less than during the two preceding seasons, yet its actual amount was 916,776 tons greater than last year. The aggregate of the business has grown to such magnitude that the percentage of increase will probably continue to decrease, although the actual increase in tons may be maintained, or even exceeded. It was expected that, because of the completion of the Duluth, South Shore & Atlantic and the Minneapolis, Sault Ste. Marie & Atlantic railroads to a junction with the Canadian Pacific, at the canal, the commerce of the canal for the season of 1888 would show no

material increase. It was supposed that the railroads would carry an amount of freight that would practically absorb the normal increase for the one season, but that by next season the conditions would be re-established, and the increase would go on as before. It is gratifying to find that, although the railroads have carried much freight that would have gone through the canal, the amount transported by the water route shows so large an increase as nearly a million tons.

The total valuation of the commerce shows an increase of but little more than \$3,000,000. This is fully accounted for by the decrease in grain, manufactured iron and copper. The first of these has already been explained, the second arises from the diminished demand for railroad iron in the Northwest, and the third is probably due to two causes, first, shipments of this valuable product by rail, and second, a restricted output from the Lake Superior mines. These causes may be considered as only temporary, and if this assumption is correct, the percentage of increase in the value of the commerce will probably be restored next season. The item "unclassified freight" only amounts to about 5 per cent. of the total freight tonnage. It includes 2,419 tons of wool and 333 tons of hides.

The number of vessels with their cargoes through the canal during the three busiest months was as follows, viz.:

For month of	Number.	Daily average.	Freight—Tons.
June.....	1,300	43.1	1,023,315
July.....	1,396	45	1,156,842
August.....	1,448	46.7	1,212,893
Totals.....	4,144	45	3,493,050

The corresponding statistics for 1887 were as follows, viz.:

For month of	Number.	Daily average.	Freight—Tons.
June.....	1,685	56.17	933,921
July.....	1,665	53.7	968,729
August.....	1,780	57.42	973,926
Totals.....	5,130	55.76	2,896,474

From which it appears that notwithstanding a decrease of 986, or 19 per cent., in the number of vessels of all classes, unregistered included, there was an increase of 593,474 tons, or somewhat more than 20 per cent., in the amount of freight carried. This was due to two causes: first, the higher stage of water in Lake Superior, and consequently in the canal; second, to the use of a greater proportion of large vessels.

The valuation of the total commerce, based on estimate of 1885, is:

1885.....	\$53,413,472.13	1887.....	\$79,031,757.78
1886.....	60,080,071.95	1888.....	82,156,019.97

Vermont Railroad Laws.

The session of the Vermont Legislature, just adjourned, passed a number of acts applicable to railroads, which are briefly summarized as follows:

Railroads are required upon request of 25 voters to give any station equal facilities with all other stations as regards market day rates.

The Railroad Commissioners are empowered to authorize the running of through trains on Sunday when public necessity and convenience may require. This law is modeled after the Massachusetts statute on the same subject.

A law was passed defining the authority of railroad commissioners in respect to relocation of highway crossings. They may, when public safety requires, order alterations and determine who shall pay for them. They must not order more than one change a year in any one county on any one railroad. They may apply to the Supreme Court to enforce their order. This Court has equity powers and may take testimony and revise the order of the Commissioners.

Frogs, switches and guard rails must be provided with foot guards before Dec. 1, 1889.

Passenger, mail and baggage cars, except on mixed trains, must have their heaters approved by the Railroad Commissioners after Dec. 1, 1889. Nothing in this act shall authorize the Commissioners to prohibit the heating of cars by steam from the engine.

All railroads shall procure and at all times keep for sale at the principal stations mileage books of not over 1,000 miles. They must be good for all the members of a firm or family, if the purchaser so demands and gives names of individuals, and the book must be of convenient size. The Railroad Commissioners may exempt any road from the provision of the act.

The Railroad Commissioners must inquire into the causes

COMPARATIVE STATEMENT OF THE AMOUNT AND VALUE OF THE COMMERCE THROUGH ST. MARY'S FALLS CANAL, MICH., FOR THE SEASONS OF 1887 AND 1888.

	1887.	1888.	Increase or decrease.		Price per unit.	Total valuation.
			Amount.	Per cent.		
Steamers.....	5,968	5,305	D. 663	11		
Sail vessels.....	2,562	2,069	D. 493	21		
Unregistered craft.....	825	489	D. 336	40		
Total vessels.....	9,355	7,863	D. 1,552	17		
Lockages.....	4,165	3,845	D. 320	8		
Tonnage, registered, net tons.....	4,897,598	5,130,659	I. 233,061	5		
" freight, net tons.....	5,494,649	6,411,423	I. 916,776	17		
Passengers.....	32,068	25,558	D. 7,110	22		
Coal, net tons.....	1,352,987	2,105,041	I. 752,054	56	\$3.50	\$7,367,644
Flour, barrels.....	1,572,735	2,190,735	I. 617,999	39	5.00	10,953,625
Wheat, bushels.....	23,096,520	18,506,351	D. 4,590,169	19	0.98	18,224,424
Grain other than wheat, bushels.....	775,168	2,022,308	I. 1,247,142	161	0.98	1,981,861
Manufactured iron, net tons.....	60,715	48,859	D. 11,856	20	50.00	2,442,950
Pig iron, net tons.....	14,204	14,844	I. 640	5	17.00	252,348
Salt, barrels.....	204,908	210,433	I. 5,525	3	1.00	210,433
Copper, net tons.....	34,886	28,930	D. 5,956	17	200.00	5,792,000
Iron ore, net tons.....	2,497,713	2,570,517	I. 72,804	3	3.50	8,996,810
Lumber, 1,000 ft. b. m.....	165,226	240,372	I. 75,146	46	18.00	4,326,696
Silver ore, net tons.....	13,401	33,541	I. 20,140	150	153.79	520,579
Building stone, net tons.....	344,586	345,854	I. 1,268	0	10.00	335,410
Unclassified freight, net tons.....			I. 1,268	0	60.00	20,751,240
Total.....						\$82,156,020

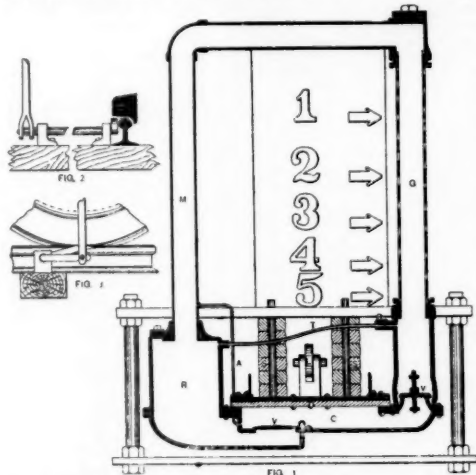
of any railroad accident resulting in loss of life, and of others if they deem best. They shall give public hearings whenever they think proper, at which the state attorney shall attend. The general superintendent or manager of each road must immediately report every accident resulting in death or serious injury, and in case of death or serious injury to a passenger must report by telegraph.

On application of three or more freeholders for gates or electric signals at any crossing, the Railroad Commissioners must investigate, and if the public safety require it order gates or signals or the maintenance of a flagman. They may order what hours the gates shall be attended or the flagman be on duty, and may amend such order from time to time. They may also apply to the Supreme Court for the enforcement of such an order.

Sign boards at grade crossings of highways must be of a description approved by the Railroad Commissioners. Signs now in use may stand while they remain legible and in good condition.

Johnson's Automatic Time Signal.

The accompanying illustration shows Johnson's Automatic Time Signal, which was briefly referred to in the *Railroad Gazette* of Dec. 14, page 823. The instrument is placed at the side of the track, where the glass tube *G* will be easily



R, Reservoir for colored alcohol. V, Valves. C, Valve Chamber. G, Glass tube. D, Rubber diaphragm. L, Lever connecting diaphragm with track treadle. S, Rubber Springs. T, Time tube. A, Air escape. M, Metal tube. B, Regulating screw.

seen by the locomotive runner. With a proper background the red column formed by the liquid in the tube is conspicuous at a considerable distance, and with large figures (four inches or more in height) the engineer needs but to glance at the signal to know its indication.

The apparatus consists essentially of a small reservoir, filled

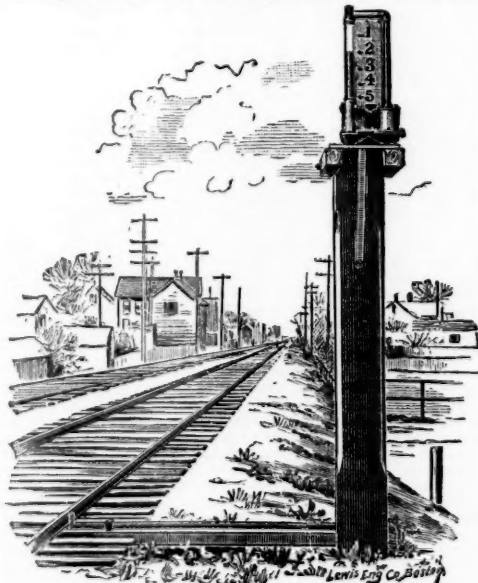


Fig. 4.

with colored alcohol, to which is attached a diaphragm pump, operated by the wheels of a passing train, through the medium of levers, whose arrangement is shown in Figs. 2 and 3. The pump forces the liquid into the glass tube *G*, which is connected at the top with the metal tube *M*, through which any surplus liquid flows back to the reservoir. After the passage of the last wheel of a train, the back flow through the small tube *T* leading to the reservoir causes the alcohol to recede. As it falls, the top of the colored column shows by its position the number of minutes which have elapsed. The rubber diaphragm over the top of the chamber between the two valves is drawn upwards by the lever, and thus draws the liquid through the lower valve into the chamber. The return motion is given by the rubber springs *S*, on either side of the lever, thus forcing the liquid through the upper valve and into the tube. Where it is desired to indicate a longer period than 5 minutes, the figures 2, 4, 6, 8, 10, are shown in place

of those which appear in the cut, and the screw *B* is so adjusted that the outflow will require twice the length of time. The principal dimensions of the instrument are: Diameter of glass tube, $2\frac{1}{4}$ in. outside; height of graduated plate, 2 ft.; inside diameter of reservoir, 5 in.

This signal is the invention of Mr. Jacob Johnson, Eastern Division, Boston & Maine Railroad, Boston, Mass. A number of them have been in use on that road for two years, and are highly recommended by the officers and men who use them. It has proved in use to be durable and to require little care, and is not affected by changes of temperature."

Train Accidents in November.

COLLISIONS.

REAR.

1st, on Lehigh Valley, at South Plainfield, N. J., an empty engine ran into the rear of a freight train backing on to a side track, doing considerable damage. The division superintendent was on the engine and was seriously injured.

3d, on Boston & Maine, at Silver Lake Station, Mass., passenger train collided with some freight cars which had run from a siding on to the main track. Engine disabled and tender and several cars damaged. One passenger hurt.

3d, on Southern Pacific, near San Francisco, Cal., a passenger train which had come to a stop on account of a disabled engine was run into by a following passenger train. Engine and 4 cars damaged. One trainman fatally hurt.

4th, on Pennsylvania, at Nanticoke, Pa., passenger train ran over a misplaced switch and into some coal cars standing on a siding. Three of the latter, together with the passenger engine, went over an embankment.

4th, on Texas & Pacific, near Marshall, Tex., freight train broke in two and the rear portion was run into by a closely following freight. Engine, caboose and 4 cars wrecked. Two trainmen hurt. Two tramps stealing a ride in a car loaded with shingles were killed and another fatally hurt. There was a dense fog at the time.

6th, on Northern California, at Oroville, Cal., passenger train ran into some cars broken loose from a preceding freight. Engineer hurt.

7th, on Cleveland & Pittsburgh, near Rochester, Pa., freight train broke in two and the rear portion was run into by a following freight, damaging several cars.

8th, near Graneros, Cal., a Denver & Rio Grande freight train ran into the rear of a Denver, Texas & Fort Worth freight train, several cars of which had been derailed, and the caboose lights having been extinguished by the shock. Two engines, caboose and several cars damaged. One trainman killed, 2 injured.

8th, on Chicago, Milwaukee & St. Paul, at Cragin, Ill., a local passenger train was run into by a closely following freight train, damaging an engine and 2 rear coaches. One passenger hurt.

8th, on New York Central & Hudson River, at Fishkill, N. Y., a passenger train standing at the station was run into by a following freight train, doing slight damage. The passengers in the rear car, seeing the approaching freight, leaped from the car; one of them fell and struck her head on a rail and was killed. The station is provided with a distant signal, to be pulled to danger by hand, but it appears that it was not pulled.

9th, on Denver & Rio Grande, near Trinidad, Col., freight train ran into the rear of a derailed freight, making a very bad wreck. One trainman killed.

9th, on St. Paul & Duluth, near White Bear, Minn., freight train broke in two and the rear portion ran into the forward one, piling up a number of cars in a bad wreck, which caught fire from the overturned stove in the caboose and was destroyed. Conductor killed.

10th, on Pennsylvania, near Ardara, Pa., freight train broke in two and rear portion ran into forward one, wrecking several cars.

10th, on Pennsylvania, near Ardara, Pa., an extra freight train ran into the rear of a disabled freight train, wrecking engine, caboose and 7 cars.

10th, on Illinois Central, near Waterloo, Ia., freight train broke in two and the rear portion was run into by a following passenger train, wrecking engine, caboose and several cars. Passenger riding in caboose fatally injured.

11th, on Baltimore & Ohio, near Wheeling, W. Va., freight train ran into the rear of a preceding freight, damaging engine and caboose.

11th, on New York, Lake Erie & Western, near Sparrowbush, N. Y., freight train broke in two and the rear section ran into the forward one, doing some damage.

13th, on St. Joseph, St. Louis & Santa Fe, near Gower, Mo., freight train ran into the rear of a construction train. Engine and 10 cars wrecked; fireman badly hurt.

13th, on Lehigh Valley, near South Easton, Pa., a Central of New Jersey excursion train ran into a Lehigh Valley engine which was taking water at a tank. Three passengers hurt.

14th, on Pennsylvania, in Philadelphia, Pa., a string of freight cars switched on to a side track could not be controlled and crashed into another lot of freight cars, doing some damage. One trainman hurt.

14th, on Atchison, Topeka & Santa Fe, at Wichita, Kan., yard engine ran into the rear of a freight train standing on a siding, wrecking 5 cars. One trainman hurt.

15th, on Louisville, New Orleans & Texas, near Gloster, Miss., passenger train ran into the rear of a disabled freight train, making a bad wreck. A dense fog prevailed at the time.

16th, on Pennsylvania, at Hilltown, Pa., passenger train collided with a freight car which had run down upon the main track from a siding. Engine overturned and damaged.

16th, on Pennsylvania, at East Newark, N. J., freight train collided with a yard engine pushing a string of freight cars on to a siding, wrecking both locomotives and throwing several cars over an embankment. Two trainmen hurt.

17th, on Chicago & Northwestern, at Marinette, Wis., freight train ran over a misplaced switch and into a yard engine standing on a siding. Both locomotives damaged; one trainman hurt.

17th, on Chicago, Burlington & Quincy, at Spring Valley, Ill., an extra freight train ran into the rear of a construction train. Engine and 5 cars derailed and damaged.

17th, on Philadelphia & Reading, at Conshohocken, Pa., coal train ran into the rear of a freight train.

17th, on Oregon Railway & Navigation Co.'s road, at Colfax, Or., a freight train descending a grade broke in two. To avert collision with the detached cars the forward portion was run down the grade at high speed and dashed into the rear of another freight, doing considerable damage. Three trainmen and a passenger riding in the caboose injured.

20th, on Denver & Rio Grande, at Palmer Lake, Colo., empty engine ran into the rear of a freight train, wrecking several cars.

20th, on Baltimore & Ohio, near Pleasant Valley, O., freight train ran into a preceding freight, damaging an engine and 4 cars. One trainman hurt.

22d, on Pennsylvania road, near Marion, N. J., freight

train broke in two and the two sections collided, wrecking several cars.

24th, on Louisville & Nashville, in Memphis, Tenn., a locomotive standing in the yards unattended started up and ran into some freight cars, doing some damage.

25th, on Illinois Central, at Irvington, Ill., freight train ran over a misplaced switch and into the rear of another freight, doing slight damage.

25th, on Delaware & Hudson Canal Co.'s road, near Cobleskill, N. Y., freight train descending a grade broke in two, and the rear section ran into the forward one, wrecking 7 cars. The wreck caught fire from a stove and 4 cars were consumed.

26th, on Chicago & Alton, at Mexico, Mo., passenger train ran into the rear of a freight train, wrecking the locomotive of the former and several freight cars. Engineer and fireman hurt.

26th, on Long Island road, at Deer Park, N. Y., a passenger train ran into the rear of a freight train which was too long for the side track, on which it was being placed. Engine disabled and 3 box cars wrecked.

27th, on Missouri Pacific, at Hiawatha, Kan., freight train struck a box-car projecting over the main track from a siding, damaging engine, several cars and a coal shed. Engineer scalded by escaping steam.

27th, on Boston & Albany, at Newton Highlands, Mass., a New York & New England passenger train ran into the rear of a Boston & Albany freight train. Engine disabled and 2 freight cars wrecked.

27th, on Atchison, Topeka & Santa Fe, near Miami, Tex., freight train broke in two and the rear portion ran into the forward one, wrecking several cars and killing a number of cattle.

28th, on Connecticut River road, near Chicopee Junction, Mass., freight train broke in two and the rear portion ran into the forward one. Two cars derailed and damaged.

BUTTING.

1st, on Cleveland & Pittsburgh, near East Liverpool, O., butting collision between two freight trains, wrecking both engines and several cars. One trainman badly hurt by jumping. It is said that the accident was caused by the negligence of an operator.

1st, on Colorado Midland, near Leadville, Col., butting collision between two freight trains, due to misunderstanding of orders, damaging both engines and derailling 8 cars. Fireman hurt by jumping.

3d, on Michigan Central, at Air Line Junction, Ohio, butting collision between a passenger train and a yard engine, damaging both locomotives and the front end of a baggage car. Four trainmen and one passenger injured.

4th, on Denver & Rio Grande, near Swallows, Col., butting collision between two freight trains, doing slight damage.

5th, on Pennsylvania, at Nescopee, Pa., butting collision between passenger train and empty engine. Two trainmen slightly hurt.

6th, on Old Colony, at Middleboro, Mass., freight train ran over a misplaced switch and into the head of another freight, damaging the engines and several cars.

8th, on Baltimore & Ohio, at Claypool's Mills, O., butting collision between two freight trains, due to misunderstanding of orders, wrecking both engines and 14 cars. One engineer killed, and the other fatally hurt.

12th, on Union Pacific, at Rock Creek Station, Wyo., butting collision between a freight and a construction train. Three engines and several cars wrecked. Two trainmen fatally and 10 laborers slightly injured.

14th, on Pennsylvania, near Wood's Run, Pa., butting collision between passenger train and switching locomotive, disabling both engines. One trainman and one passenger hurt.

14th, on Baltimore & Ohio, at Valley Falls, W. Va., a fast passenger train ran over a misplaced switch and into the head of a freight standing on a siding, wrecking both engines and several cars of each train. Three trainmen and 2 tramps killed and 4 trainmen fatally injured.

15th, on Connecticut River road, at Northampton, Mass., butting collision between a passenger train and a switching freight, damaging engine of the former and 5 freight cars. Two trainmen hurt. The wreck caught fire, but the flames were quickly extinguished.

19th, on Union Pacific, near Wilcox, Wyo., butting collision between a freight train drawn by two engines and a construction train. Locomotives and 8 cars wrecked. Two trainmen and several laborers injured.

19th, on Atchison, Topeka & Santa Fe, in Kansas City, Mo., butting collision between two freight trains, damaging both engines. Two trainmen and several passengers slightly hurt.

23d, on Cleveland & Pittsburgh, at Hammondsville, O., butting collision between two freight trains, piling up both engines and several cars in a bad wreck. Two trainmen killed, 2 seriously injured. It is stated that one of the crews disobeyed orders.

25th, on Chicago, Rock Island & Pacific, near Atkinson, Ia., butting collision between a passenger and a freight train, wrecking the engines and several cars in each train. A tramp riding on the platform of a baggage car was killed.

26th, on New York Central & Hudson River, near Brighton, N. Y., butting collision between a passenger and a freight train, doing some damage. Two trainmen hurt.

26th, on Pennsylvania, near Conemaugh, Pa., engine of a freight train, which had been run ahead for water, in returning collided with its train, which was being pushed ahead a short distance by another engine. Locomotive and several cars wrecked. One trainman killed.

26th, on Denver & Rio Grande, near Husted, Colo., butting collision between Chicago, Rock Island & Pacific and Denver & Rio Grande passenger trains, wrecking the engine and several cars of the latter train and engine and one car of the former. The Rio Grande train caught fire from an overturned stove and 3 cars were destroyed. Two trainmen killed, 4 seriously and several slightly hurt. The Rock Island cars had vestibule buffers and had no fires in them. An operator is blamed for not properly delivering orders.

29th, on Kansas City, Fort Scott & Memphis, at Lamar, Mo., butting collision between two freight trains, disabling both engines.

30th, on Chicago & Atlantic, near Crown Point, Ind., butting collision between two freight trains, doing considerable damage.

30th, on Northern Pacific, near Bismarck, Dak., butting collision between an accommodation train and a freight, wrecking both engines. Several trainmen hurt.

CROSSING AND MISCELLANEOUS.

2d, on Richmond & Danville, at King's Mountain, Ala., passenger train ran into the side of a freight train taking a siding. Engine and several box cars damaged. The freight was on the left of the approaching passenger runner, and the brakeman who signaled him also remained on that side of the main track, and the signal was not seen soon enough.

3d, on Fitchburg road, at North Adams, Mass., a freight train was turned on to a cross-over track by a misplaced switch, and ran into the side of another freight, damaging 2 cars and a station platform.

6th, 7 p. m., on Brooklyn Elevated, in Brooklyn, N. Y., a

passenger train which had just started from the station near the intersection of Myrtle and Hudson avenues ran into the side of an engine of another passenger train just crossing its tracks. Both trains were moving slowly, and no person was hurt, but the engine run into was derailed, and came very near falling to the street. The scene of the accident is a regular grade crossing at right angles, though both lines are owned by the same company. There are interlocked home signals, but the signal cabin obstructs the view in one direction. It is said the engineer at fault acknowledges that the signal was properly set against him.

6th, on Norwalk, O., collision between Lake Shore & Michigan Southern and Wheeling & Lake Erie freight trains, resulting in considerable damage.

11th, at Westfield, Mass., freight train on the New York, New Haven & Hartford ran into a freight train of the Boston & Albany at the crossing of the two roads, derailling 2 cars of the Boston & Albany train and the engine of the other. Both trains had nearly come to a stop. The crossing is provided with interlocked home and distant signals.

12th, in Rochester, N. Y., a West Shore passenger train ran into a New York Central & Hudson River freight train. Engine and 4 box cars damaged.

12th, at Cucharas, Col., a Denver, Texas & Ft. Worth freight train ran into a Denver & Rio Grande freight doing some damage.

23d, at Bradford, Pa., a Bradford, Bordell & Kinzua passenger train was backed over a misplaced switch and into a New York, Lake Erie & Western passenger train just leaving the station, overturning one of its cars. Several passengers slightly hurt.

24th, on Boston & Albany, at Pittsfield, Mass., two freight trains moving on parallel tracks came together at a switch. Engine and three cars badly damaged.

27th, at the crossing in Pueblo, Col., a Denver & Rio Grande freight train ran into a Missouri Pacific freight, damaging an engine and one car.

DERAILMENTS.

DEFECTS OF ROAD.

3d, on Southern Pacific, near Los Angeles, Cal., engine and baggage car of a passenger train derailed at a defective switch. Engine overturned and badly damaged; fireman injured.

8th, on Cleveland & Pittsburgh, near Rochester, Pa., 5 cars of a freight train thrown from the track by the spreading of the rails.

9th, on South Carolina, near Camden Junction, S. C., 2 cars of a passenger train thrown from the track by a broken rail. Five passengers hurt.

9th, on Kansas City, Memphis & Birmingham, near Jasper, Ala., a trestle over French Creek gave way under a passing freight train, the caboose and 3 cars going down with it. Two trainmen and 2 tramps injured and 1 tramp killed.

11th, on Baltimore & Ohio, near Wheeling, W. Va., passenger train thrown from the track by the spreading of the rails.

12th, on Louisville & Nashville, at Hanceville, Ala., rear car of a passenger train backing on to a siding was derailed by a defective switch and thrown over an embankment. One passenger slightly hurt.

13th, on Pittsburgh & Western, at Stone House, Pa., passenger train thrown from the track by a broken rail. Fireman and one passenger injured.

15th, on Missouri Pacific, near Eldorado, Kan., a freight train broke through a bridge over Walnut River. The locomotive and 10 cars were completely wrecked, 100 head of cattle killed and many crippled. The engineer and fireman both went down into the stream. The former was pinned in the wreck and was only saved by the heroic conduct of the fireman who, though badly bruised, crawled to the engineer and for an hour supported his head above water.

15th, on Cincinnati, Indianapolis, St. Louis & Chicago, near Harrison, O., passenger train thrown from the track by the spreading of the rails and several cars overturned, injuring 6 passengers.

18th, on Denver, Texas & Ft. Worth, near Rhome, Tex., 4 cars and caboose of a freight train broke through a bridge. Two tramps stealing a ride hurt.

20th, on Cincinnati, Indianapolis, St. Louis & Chicago, near Simonson's, O., passenger train thrown from the track by the spreading of the rails on a curve and overturned into the ditch. Nine passengers injured.

24th, on Central of Georgia, near Clayton, Ala., 7 cars of freight train thrown from the track by the breaking of a rail.

28th, on Southern Kansas, near Baldwin City, Kan., passenger train thrown from the track by a broken rail. The cars went over an embankment and caught fire from overturned stoves, but the flames were quickly extinguished. Six passengers seriously hurt.

DEFECTS OF EQUIPMENT.

3d, on Louisville & Nashville, near Gallatin, Tenn., 7 cars of a freight train derailed and wrecked. A loose wheel is said to have caused the accident.

8th, on Denver & Rio Grande, near Graneros, Col., a Denver, Texas & Ft. Worth freight train derailed by a broken axle.

9th, on Denver & Rio Grande, near Trinidad, Col., a Denver, Texas & Ft. Worth freight train was derailed by a broken wheel.

15th, on Missouri Pacific, near Pacific, Mo., engine and tender of freight train derailed by the breaking of a wheel under the latter. It went over an embankment and one trainman was killed and 5 badly hurt.

17th, on New York, Lake Erie & Western, near Deposit, N. Y., several cars of a freight train derailed by the breaking of a truck.

20th, on Wisconsin Central at Colfax, Wis., engine and one car of a freight train derailed and wrecked by the breaking of a wheel. Engineer slightly and fireman fatally injured.

22d, on Cincinnati, Wabash & Michigan, at Fox's Ind., 6 cars of a freight train derailed by the breaking of a truck and wrecked.

30th, on Jeffersonville, Madison & Indianapolis, near Flat Rock, Ind., caboose and several cars of a freight train derailed by a dead-block of a car becoming loose and falling upon the track.

NEGLIGENCE IN OPERATING.

3d, on New York, New Haven & Hartford, at Bridgeport, Conn., passenger train ran over a misplaced switch, derailling engine and 2 cars.

4th, on Louisville & Nashville, near Bangor, Ala., 15 cars of a freight train were derailed and badly wrecked by a piece of pipe falling out of a car upon the track. Employee injured.

5th, on New York, Lake Erie & Western, at Ravenna, O., freight train derailed by a misplaced switch and 9 cars wrecked.

9th, on Wabash, at Elvaston, Ill., engine and several cars of freight train derailed by a misplaced switch and damaged.

12th, on Richmond & Danville, near Folsom, Ga., all but the engine of a passenger train, consisting of baggage, express, 2 passenger and a sleeping car were derailed at a point where track repairs were in progress, and went over a

15-ft. embankment. The sleeping car caught fire from the stove and, together with one coach, burned up. Six trainmen and 8 passengers injured.

16th, on Missouri Pacific, in St. Louis, Mo., in making a flying switch 7 cars of a freight train were derailed and damaged. A brakeman was thrown from a car and badly hurt.

18th, on Boston & Maine, at Chelsea, Mass., several cars of a freight train were shoved off the end of a spur track and demolished one side of an adjacent house.

19th, on East Tennessee, Virginia & Georgia, at Dames' Ferry, Ga., 2 cars of freight train derailed by a misplaced switch.

22d, on Wisconsin Central, near Penokee, Wis., special passenger train thrown from the track by a misplaced switch. The engine and baggage car went over an embankment.

28th, on Fitchburg road, near Charlestown, Mass., passenger train derailed by a misplaced switch.

29th, on Chicago & Northwestern, at Racine, Wis., freight train derailed by a misplaced switch.

UNFORESEEN OBSTRUCTIONS.

4th, on Louisville, New Orleans & Texas, near Vicksburg, Miss., freight train run over a cow and the engine and 13 cars were derailed and wrecked. Two employees and a tramp killed, two trainmen injured.

8th, on Pennsylvania, near Bordentown, N. J., engine of passenger train thrown from the track by ties which had been maliciously placed on the rails.

10th, on New York, Lake Erie & Western, near Tonawanda, N. Y., 14 cars of a Lehigh Valley freight train were derailed at a point where the road-bed was flooded by the breaking of a dam.

13th, on Pittsburgh & Lake Erie, near Beaver Falls, Pa., passenger train ran over a cow, and the engine and one car were derailed and damaged.

13th, on Pittsburgh, Cincinnati & St. Louis, near Kouts, Ind., a construction train, the engine of which was running tender first, ran over some cattle, and was derailed and thrown over an embankment. One laborer killed, 9 injured.

14th, on Western New York & Pennsylvania, near Mt. Morris, N. Y., freight train ran over a cow and 17 cars were derailed and wrecked, killing a number of cattle.

17th, on Lehigh Valley road, at Hazleton, Pa., 12 cars of a coal train being propelled by an engine at the rear end were derailed by a cow on the track. Brakeman injured by jumping.

26th, on Maine Central, near Winthrop, Me., engine and 15 cars of a freight train derailed, at a point where the road-bed had been impaired by high water, and thrown into Lake Maranacook. The engineer and fireman went into the lake with the locomotive and were injured, but were able to swim ashore.

28th, on Pennsylvania road, near Port Clinton, Pa., engine of freight train derailed by a rock which had rolled down upon the line.

UNEXPLAINED.

1st, on Louisville & Nashville, near Newport, Ky., engine of passenger train derailed at a curve and, together with a postal car, thrown over an embankment. Three trainmen slightly hurt.

d, on Missouri Pacific, near Cheltenham, Mo., yard engine derailed.

2d, on St. Louis Bridge & Tunnel road, at St. Louis, Mo., 4 cars of switching freight train derailed and badly damaged.

4th, on St. Louis, Iron Mountain & Southern, near Peveley, Mo., freight train derailed and wrecked.

7th, on Buena Vista & Ellaville, near Ellaville, Ga., passenger train derailed and partially wrecked. Five passengers killed, conductor and about a dozen passengers injured.

8th, on Utah Central, near Salt Lake City, Utah, 3 cars of coal train derailed and wrecked.

10th, on Galveston, Sabine & St. Louis, near Flanagan City, Tex., mixed train derailed, wrecking a stock car and throwing 2 coaches down an embankment. One trainman and 2 passengers hurt.

10th, on International & Great Northern, at Franklin, Tex., several cars of accommodation train derailed, injuring a trainman and a passenger.

10th, on Cincinnati, Indianapolis, St. Louis & Chicago, near Cleves, O., freight train derailed in a tunnel.

11th, on Newport News & Mississippi Valley, near Yokena, Miss., a car in a freight train derailed. The car ran about 5 miles before the derailment was discovered, damaging nearly all the joint bars on one side of the track.

12th, on Connecticut River road, at West Swanzey, N. H., freight train derailed.

12th, on Chicago, St. Paul, Minneapolis & Omaha, at West Superior, Wis., locomotive and 3 cars of a freight train derailed.

13th, on Colorado Midland, near Manitou, Col., freight train derailed on a curve, several cars going over an embankment.

13th, on Chicago, Burlington & Quincy, at Downer's Grove, Ill., engine of freight train derailed at a frog and thrown against the engine of an approaching passenger train on the adjoining track, doing considerable damage and injuring 2 trainmen.

13th, on Central of New Jersey, near West Bergen, N. J., several cars of freight train derailed.

14th, on Central of New Jersey, at North Branch, N. J., freight train derailed, demolishing 16 cars.

16th, on Louisville & Nashville, in Montgomery, Ala., car in freight train derailed.

16th, on Oregonian, near Sheridan, Or., 4 cars of freight train derailed and overturned. One of the cars contained 25 Chinamen, but the train was moving slowly and no one was seriously hurt.

16th, on Mobile & Ohio, near Moscow, Ky., freight train derailed and a number of cars wrecked.

19th, on Wabash road, at New Salem, Ill., passenger train derailed and the engine thrown over on its side.

20th, on Covington & Macon, near Madison, Ga., passenger derailed in a bridge and several cars tipped off into the stream. One trainman hurt.

20th, on Bloomsburg & Sullivan, near Bloomsburg, Pa., car of passenger train derailed and ditched.

20th, on New York, New Haven & Hartford, at East-hampton, Mass., car of gravel train derailed and overturned.

20th, on New York, New Haven & Hartford, at East-hampton, Mass., car in freight train derailed.

22d, on Southern Pacific, near South Side, Cal., 5 cars of a freight train derailed and wrecked.

23d, on St. Louis, Iron Mountain & Southern, near Garner, Ark., engine of freight train derailed. Engineer slightly hurt by jumping.

27th, on Pennsylvania road, in Philadelphia, Pa., engine of freight derailed at a switch and overturned.

28th, on New York, Lake Erie & Western, near Otisville, N. Y., several cars of a freight entering a side track derailed. The caboose caught fire from an overturned stove and 4 cars were burned up.

29th, on Denver & Rio Grande, at Pleasant Valley Junction, Utah, empty engine derailed and went over an embankment. Fireman killed and engineer badly hurt.

30th, on St. Louis, Iron Mountain & Southern, near Hoxie, Ark., freight train derailed.

OTHER ACCIDENTS.

2d, on Richmond & Danville, near Salisbury, N. C., engine of passenger train broke a piston-rod, knocking out the cylinder head.

12th, on South Pacific Coast, near San Francisco, Cal., a parallel-rod of the engine of a passenger train broke as the train approached the end of a pier. One of the broken ends tore a hole in the boiler. The passengers were alarmed and feared the train would run off the end of the track into the water and some of them jumped off. Two of these were injured.

13th, on Pennsylvania, near Conemaugh, Pa., sleeping car of passenger train caught fire, presumably from the stove, doing some damage and destroying the clothing of a number of passengers.

28th, on Chesapeake & Ohio, near Kanawha, W. Va., truck under car in a freight train broke down.

A summary will be found in another column.

Locomotive Tires—Western Railway Club.

At the meeting of Dec. 18 one topic discussed was the standard tire of the Master Mechanics' Association.

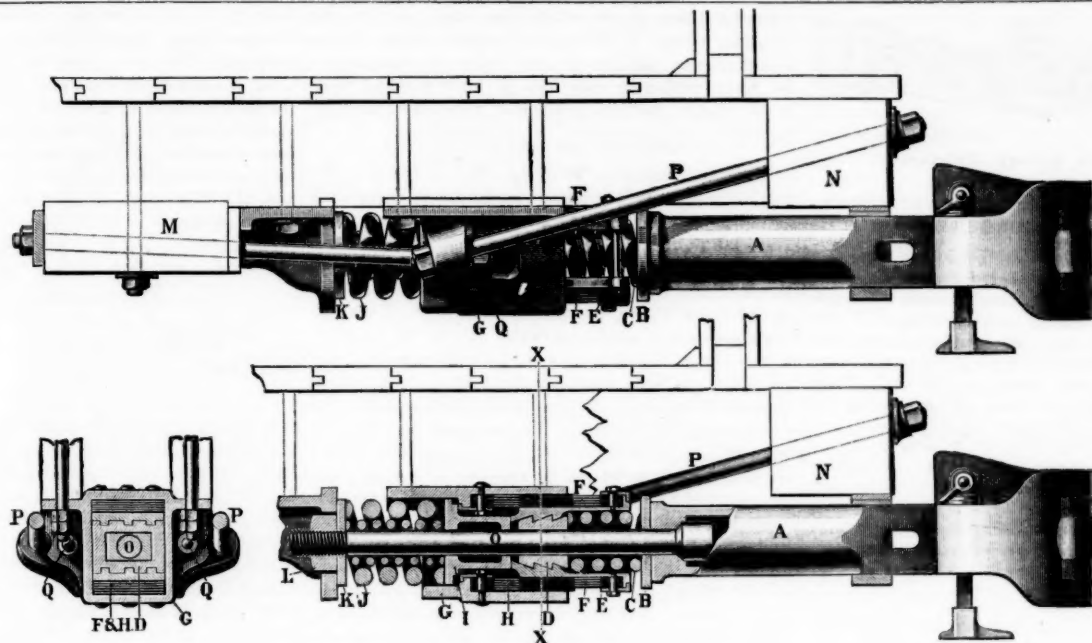
President RHODES called Mr. Schroyer to the chair and opened the discussion. He said: I am going to take the matter up by first asking you to consider what advantage there is in adopting the Master Mechanics' standard. I want to speak about that particularly, because a year ago when Mr. Lauder spoke on that subject I did not see where the gain was to be in changing our standard driving-wheels to conform to what the master mechanics had recommended. I now see where there is great advantage. On the Chicago, Burlington & Quincy I was quite surprised to find that we carried about \$8,000 worth of tire stock constantly. I found that we had a section peculiar to our road, so that it did not pay the tire companies to carry it. Now if I lay a section of our tire and of the Master Mechanics' standard together you can see they are very nearly alike. The Master Mechanics' flange is a little heavier than ours. That is about all, yet under our rules we cannot use it. When we began to consider the adoption of the Master Mechanics' standard, we found that there were several things that we did not consider perfect in what they recommended. They adopted a section, but I understand have not adopted any width of tire. That is to say, the contour lines of the flange and the tread have been adopted, but they have not adopted any width. Now it is very important that we should use a certain width and we wrote to the chairman of the Master Mechanics' committee about it. He answered that there was considerable inclination among the master mechanics to use a tire 5½ in. wide. That was what we were using, but some recommended a tire of 5¼ in. wide. The 5½-in. tire is the Master Car-Builders' section, which is made 5½ in. wide to run on tracks of varying gauges. Experience has shown that a wheel of 5½ in. width will run on these various gauges. Now if a car wheel fitted up for a 4 ft. 8½ in. track will run on a 4 ft. 9 in. track, the tire being 5½ in., how much easier will it be for an engine that never has to change tracks? So that on our road, without looking into the matter at all, we adopted the 5½ in. We save the quarter inch of metal all around.

The next question in the adoption of the Master Mechanics' standard is the gauges that should be used. I have here a set of Pratt & Whitney's gauges. We call these the Master Mechanics' gauges. The tire companies have the same gauges, and they will furnish the tire ready bored corresponding with these, and the shops should have a shop gauge, or a shop centre, to which they would turn the tire, and another gauge to which they would turn the centre. On our road our centres, with one exception, are all different from what the Master Mechanics' have recommended. Our centres were 44 in., 53 in., 57 in. and 63 in. We find that the 44-in. centre requires no change except to adopt this gauge and turn to the Master Mechanics' standard. Our 53-in. centre would be compared with the Master Mechanics' 50-in. and we have not met that question yet. With our 57-in. centre, by turning off a half inch on each side we get the Master Mechanics' standard 56-in. With our 63-in. centre, by turning off in the same way a half inch for the spider on each side, we get the Master Mechanics' 62-in.

Some years ago we adopted a tire with the ends of the tread tapering off a little. The reasons for doing that have changed since. At that time we used a brakeshoe which rubbed on the tread at the part where the tread wore on the rail, but the Ross-Mechan shoe has come into such general use now that it really changes those conditions, and the reason for the tapering no longer exists, and in adopting the Master Mechanics' standard some roads do not wish to have the taper. Perhaps this might prevent the adoption of a standard, and at present, until some one shows some argument which I do not see just now, I would be willing to waive this tapering off now that we have shoes bearing on the flange at the outer edge of the rim. The reason for that form no longer exists. In fact, on our road we have some shoes where the flange has worn away quicker than the part of the tire that wore on the rail.

Now to consider a little the question of 3 in. and 4 in. tires. A year ago, when this matter was brought up, we presented a tabulated statement regarding tires 3 in. as against 4 in. The practice on the Chicago, Burlington & Quincy for a number of years has been to use a 4-in. tire, and in looking up these figures we expected to find that the 4-in. tires were giving better service than 3-in. When the paper was presented at the club it seemed to be so conclusive the other way, that without investigating as to whether the paper was quite accurate, I gave the figures, showing quite conclusively that on certain engines the 3-in. tire was decidedly more economical than the 4-in. Since then we have gone into the matter more thoroughly, and have got a variety of results from passenger engines and from freight engines, and the figures are altogether in favor of the 3-in. tire. We are so well satisfied with it that a year ago we gave orders that tires thereafter were to be half 3 in. and half 4 in. Last week we gave an order that no more 4-in. tires were to be ordered for the C., B. & Q. I will read you a few results that we have obtained. Here is a record of seven engines with 3-in. tires. Their first turning averages 13,382 miles per 16th; with 4-in. tire we have 9 engines, whose first turning averages 8,338 miles per 16th. At the second turning there were seven engines with 3-in. tire, averaging 12,954 miles. Of the 4-in. tire we have nine engines, averaging 8,078 miles. On the third turning we have eight engines with 3-in. tire, averaging 8,148 miles per 16th. We have four engines with 4-in. tire doing a little better than that, averaging 9,458 miles. At the fourth turning we have two engines with 3-in. tire, averaging 10,523 miles. Of the 4-in. we have two engines, averaging 5,696.

Replying to questions from Messrs. Verbruyck, Rock Island; George Hackney, Santa Fe; Cushing and others, Mr. Rhodes said that he attributed the difference to the density of the material, believing the 3-in. tire to be more thoroughly worked. He believed that the same rule applied to a rail. One that is not so deep in the head wears better. The tires were not all of the same make, but were tested in classes designated, so that each make of tire is



THE WESTINGHOUSE FRICTION BUFFER.

shown by itself. He said that the conditions under which the engines worked were regarded, and quoted letters from master mechanics on his road showing that in testing, engines with the same weight on drivers and in same class of service were selected for the comparison.

Mr. SWANTON, Pennsylvania lines, said the tires on his road were altogether 3-in. He thought it was an important matter to have the wheel centres as wide as possible, as a narrow wheel centre is more liable to get loose. He preferred a 5½-in. wheel centre with a tire a little wider so as to project over a little.

Mr. JOHANN doubted whether there was really much difference in the density of 3-in. and 4-in. tires, but believed the quality of the ingot which is worked into the tire was responsible for the quality of the tire itself. The imperfections will remain, no matter how much you press it or roll it. He thought the handling of engines had much to do with the wear of the tire. A careful man will get double the mileage out of the tire that a careless one will. Regarding the width of tire, being one of the committee in adopting the standard, he said that the width was purposely left open in order to harmonize. The open hearth tire showed a better result than the crucible steel tire.

Mr. W. FORSYTH, C. B. & Q., said that the members should not make the mistake of basing their calculations upon old methods of considering the relative merits of 3-in. or 4-in. tires.

At the invitation of the chairman, Mr. Munton, Superintendent of the Chicago Tire & Spring Works, explained the working of a new machine, by which tires can be rolled from a large diameter to a small one. Mr. Stevenson, of the Standard Tire Co., also showed the advantage of standards both to the railroad companies and to the manufacturers. Mr. Fowler, of the Fowler Cast Steel Wheel Co., in response to an invitation, favored the club with the practice in making the rolled steel car wheel out of the rough metal.

Massachusetts Commissioners' Report—Accident at Boston.

The Railroad Commissioners of Massachusetts have issued a report on the accident on the Fitchburg road July 23 last, when a part of the pile structure near the Boston station gave way and caused the death of a brakeman and the destruction of several passenger cars. They say that the accident was caused by the removal, by an unknown person, of a red flag which was placed on the dangerous portion of the yard track. The flag was put there by the station agent who noticed the trouble. Repairs were making when the flag was displaced, and Yardmaster Hughes, seeing that the track had been relaid and the flag removed, ordered cars to be run upon the section, not knowing that workmen were then repairing the piles beneath. [The workmen barely escaped.] The Commissioners continue: So far as the premature removal of the flag was concerned, it was due to a loose and indefinite way of giving and receiving orders. Where danger has existed the signal of danger should not be removed except upon definite order from proper authority, and where misunderstanding is possible the order should be repeated by the person to whom it is given. This accident, like many others, shows that there is room for great improvement in the accuracy of transmitting orders, and in a more definite determination of the extent of the powers and duties of the respective officials, and the general managers of the various roads are earnestly recommended to make a careful study of their working organization, to find whether they can themselves accurately define the limits of the powers and duties of the various subordinate officials, and to learn whether such officials correctly understand the scope of their respective powers and duties. This accident and investigation have also emphasized the importance of having a careful inspection of piles below low-water mark made by divers as a prerequisite to the engineer's report to the commissioners.

The Westinghouse Friction Buffer.

This device was illustrated and somewhat discussed in our issue of Nov. 2, but the cuts which we give herewith show more clearly than did the earlier illustrations the method of attaching it to the car, and its action. In a circular just issued by the makers the action of the buffer is thus described:

When the drawhead is pressed back, the first inch of its motion compresses the initial spring *C*, driving back the wedge block *D*, thereby forcing apart the wedge plates *EE* and compressing the interlocked sets of movable and fixed friction plates *FF* and *HH*. Any further inward movement of the drawhead results in movement, in the same direction, of the wedge plates *EE*, movable friction plates *FF* and

thimble casting *I*, and through them the compression of the main draft spring *J*. That portion of the thrust due to the compression of the initial spring and the friction between the plates *FF* and *HH* is taken up and transmitted to the end sill of the car body by main stay bolts *PP*. That portion of the thrust due to the compression of the main draft spring is taken up by the back casting and body bolster. The total thrust is thus passed through an elastic medium and distributed very generally through the sills.

When the drawheads are subjected to a pull, as from the traction of a locomotive, the main draft spring draws against the thimble casting, which is normally seated against an internal flange of the housing *G* and the buffing apparatus is then inoperative.

The following figures have been determined by the average of several tests made in Riehle & Olsen machines:

Resistance due to initial spring.....	Lbs. 13,000
" " friction.....	37,445
" " draft spring.....	18,000
Total resistance.....	68,445
Work done in compressing the friction buffer.....	Foot lbs. 8,388
Work done in compressing present ordinary draft spring, 6 by 8 in., 1½ in. motion, and 15,000 lbs. capacity.....	1,314
Ratio of work done in compressing buffer to work done in compressing ordinary draft spring.....	3377=6.46

The Deterioration of Steam Boilers.

Mr. J. M. Allen, in a lecture delivered at Sibley College, spoke of the causes continually acting to destroy a boiler after it is completed and set to work. Some of these causes arise from improper construction and setting, others from the use of impure feed water, and careless or ignorant management often exists. Externally fired boilers, where the bottom sheets are more expanded than those at the top, should be suspended or supported in such a manner that they can accommodate themselves to the changes of form occurring when heated, and a current of cold air should never be allowed to impinge against heated sheets. Internally fired and fire-box boilers usually have narrow passages in which sediment is collected and scale formed. Hand holes should be placed so that narrow water passages can readily be cleaned.

In the construction of steam boilers, the use of the drift-pin to correct faulty spacing of the rivet holes, causes strains which may soon become dangerous. Braces are frequently secured with split pins instead of bolts, and thus greatly weakened.

Deposits of scale and sediment are caused by the use of impure feed water and by returning exhaust steam, containing oil, to the boiler. The impurities of water consist of the carbonate and sulphate of lime, magnesia, alumina, silica and some organic matters. Carbonate of lime and magnesia are frequently deposited on the sheets of boilers in the form of light powder, which can be removed by blowing off two

gauges of water two or three times a day, using the bottom blow, or, if the impurities do not sink, blowing from the surface. The proper periods for blowing are when the water in a boiler has been at rest for some time, in the morning and at the close of the dinner hour, just before starting up. Soda ash is a good antidote, in cases where the carbonate and sulphate of lime are the principal impurities. From 8 to 10 pounds, dissolved in warm water, should be introduced into the boiler every week, and the boiler should frequently be blown down and cleaned. Other scale preventives which can be recommended are: Soda ash, one part, by weight, catechu two parts; tannin; and a solution made by boiling the leaves of the eucalyptus tree. There is no universal specific to prevent the formation of scale, and it is well to analyze the feed water, so that a remedy can be applied intelligently.

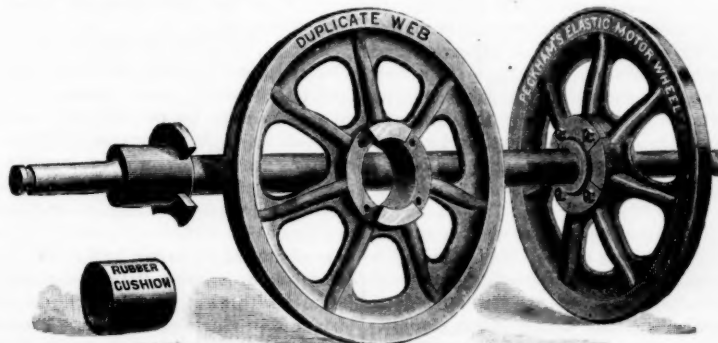
Boilers are corroded by water from swamp lands, by water contaminated with spent dyes and refuse, and corrosion is sometimes caused by using water which is so pure that it acts as a universal solvent. The presence of air and dissolved gases, the acid decomposition of grease and oil, and organic matters, in feed water, cause corrosion. Certain salts, such as nitrates and ammonia salts, render water very corrosive.

The Peckham Elastic Motor Wheel.

This wheel is designed to overcome certain objections that arise in the use of the ordinary cast-iron wheel on electric motor cars. Its rubber cushion is intended to protect the axle and the machinery from the injury arising from the jarring that will be communicated to them when there is no non-elastic substance interposed between the tread of the wheel and the bearings of the motor. The interchangeable feature of the wheel enables the worn out portion to be renewed without removing the machinery from the axle, and in a shorter time than would be required to make such a removal. After the wheels with the motor are run from under the car, everything can be made ready to go back again in two hours, by any unskilled laborer who knows enough to handle a monkey-wrench.

The wheel consists of a central hub, which is pressed upon the axle like any ordinary car wheel. Outside of this is placed a rubber bushing, which in turn carries the web or wheel proper. The whole is held together by a front flange and four bolts. As electric cars are driven from the axle between the wheels there is a clutch on the back of the web that locks into the hub, so that the bolts are relieved from strains due to the rotation of the wheels.

These wheels are meeting with the appreciation of street railroad companies, and some of the electric motor manufacturers have found them advantageous, because of the saving in wear and tear of their machinery and in cost of renewals. The wheel is made by the Peckham Street Car Wheel & Axle Co., New York.



THE PECKHAM ELASTIC MOTOR WHEEL.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

It has been assumed from the start that a certain class of injurious and destructive shocks to which draw gear is subjected would be increased rather than diminished by the use of automatic couplers, and we believe that in practice the assumption has been borne out. That is, it has been assumed that the cars would be run together at greater speed, and handled more roughly in making up trains, and in yard work generally, when there were no men between them to look out for. The makers of automatic couplers have recognized this fact as one of the troubles before them, and have tried to provide for the additional wear and tear. How successful they have been is yet a matter of doubt, but there are a good many people who think that the success of the automatic coupler can only be complete when it is used with some better buffing arrangement than has yet been put in service. Whether or not this idea is entirely correct, the number of cars side-tracked for repairs to broken draw gear bears an enormous proportion to those disabled in other ways, even with the link and pin coupler, and the reluctance to take the risk of increasing that proportion must be reckoned on to delay the use of the automatic coupler. The very ingenious friction buffer which is shown on another page has, therefore, an importance which it would not have had a few years ago, and its performance in actual service will be watched with great interest.

The enforcement of demurrage collections is making progress in all parts of the country. We print in another column an account of the doings of some of the most pronounced objectors among consignees, but the general opinion seems to be that consignees are co-operating with the railroads fully as well as was expected. The people of Chicago, whose displeasure is most heard of, sent a committee to complain before Commissioners Cooley and Morrison, when those gentlemen were in that city last week, and were promised that the subject should be considered by the Commission. Cleveland is the only place from which we hear reports of abandonment of the reform or of any of its features. The Chicago Association, at the first regular monthly meeting, is said to have found things in better condition than was expected. About \$5,000 was collected during the first ten days. In the South the rules adopted by the Southern Railway & Steamship Association have worked very satisfactorily thus far, and the managers feel much encouraged. Obstacles similar to those found elsewhere have been met, but they are in a fair way to be removed. The rules have been adopted at several points outside the territory of the association. The Southern men, like those of the North, found some cities in very bad shape. At one not very large place the average number of cars unnecessarily standing for use as warehouses was 300. At another point one man kept 15 cars on hand as a general thing, using

some of them from which to retail goods. At Atlanta, which is peculiarly situated, there being many private sidings, it was expected there might be some difficulty, but things have worked very satisfactorily, and the merchants have cheerfully co-operated.

The communication from Mr. Bayles, on car lighting, which will be found on another page, calls attention to what appears to him an omission in an editorial published last week on that subject. We did not overlook the Pintsch lamp. On the contrary, the Railroad Gazette has followed with much interest the progress of the Pintsch system in America and has done something to advance it. We did not, in fact, write of any lamp, for we know of none that has yet been put into anything more than experimental use that does the work which Mr. Bayles claims for the new Pintsch lamp. We have seen no report of tests of the Pintsch lamp now in use that shows an illuminating power of 35 candles with a gas consumption of 2.5 cu. ft. per hour. Probably these results have been obtained with the new lamp now undergoing trial. Whether or not they were got from a lamp now in use, or from an improved lamp which will be offered to the railroads, we shall be glad to publish them. Reports of tests of the standard four-burner lamp, which we have seen, certainly show no such efficiency. That the Pintsch gas may be carried in sufficient quantity to light a car from New York to Chicago and back with the lamps now furnished is quite possible, but is it done in practice? On the Erie, with an average initial pressure in the tanks under the cars of 135 pounds, two cylinders are often, if not ordinarily, used for the long run cars. Gas-lighted cars are run through to Chicago, but we understand that it is the practice to recharge the cylinders at Marion once, if not twice, in the round trip. An auxiliary gas plant was built there for this purpose. Moreover, the light on these through trains is often not brilliant enough to read by with comfort. This may be due to an economy of gas in order to reduce the expense, rather than to inadequate supply, but those who are accustomed to travel by gas-lighted trains on this and other roads have sufficient evidence that for some reason gas is often burned very sparingly, and it is not at all unusual to find better illumination from oil lamps than from gas. This is especially true of the older forms of Pintsch lamp. The four burner lamp which has been in use more recently has been pretty satisfactory to passengers, when it got gas enough. If the company now has a still better lamp, one which will effect a greater economy of gas, and so encourage the use of this clean and safe method of lighting, we are glad to know it. On the Pennsylvania, where another system is used, the coaches are provided with two cylinders each 10 ft. by 15 in. They carry gas at a pressure of under 300 lbs. in the storage tanks, and not much, if any, above 200 lbs. on the cars. These cars are lighted usually with six burners, and some with four burners, and according to a printed notice put in the closet of each car for the use of trainmen, the supply of gas will last only 5½ hours for the standard, and eight hours for the four-burner car. The gas used in these cars is generally compressed city gas, although at Harrisburg they are provided with oil gas. We think that these facts, with regard to the existing practice on the Erie and the Pennsylvania, warrant the statement made before, that a bar to lighting by gas has been the difficulty of carrying gas enough to supply a good light for a long journey. If this difficulty is now overcome by better lamps and by practicable and economical plans for distributing the gas to different points by tank cars, the railroads and their patrons are certainly to be congratulated. Unfortunately, the European experience with gas is not regarded as conclusive, for it is generally to be supposed that the runs are shorter than here and people contented with less light.

Heating Shops and Mills.

In the discussion by the New England Railroad Club on the arrangement of shops, which is printed on another page, the question of heating received a little attention, just enough to indicate the disagreement as to whether or not it is well to put the pipes overhead. Probably there is no absolutely best position for the pipes under all conditions, but the experience of Mr. Griggs must not be taken as conclusive against putting them overhead. The overhead system of heating by direct radiation has long been in use, and has met with great favor in certain localities, particularly in New England factories. As usually arranged, five or six rows of 1½-in. pipe are suspended the whole length of the room, about 3 ft. from the wall, and

from 2 to 4 ft. below the ceiling, one running foot of pipe being allowed for each 90 cubic feet of space to be heated. Some experiments made by Mr. C. J. H. Woodbury indicate that with overhead pipes the heat is distributed throughout the room at least as well as is the case with pipes on the side, near the floor. In these experiments the thermometers were hung in the centre of the room, at different heights, and the following are the mean temperatures from hourly readings:

Location of thermometers.	Temperature, Fahrenheit.	
	Pipes on side, near floor.	Pipes overhead.
16 in. from ceiling.....	80.05	80.80
Midway.....	76.52	76.90
16 in. from floor.....	77.08	77.00
Average.....	77.88	78.23

It is claimed by some experts in steam heating that the whole question is one of convenience, while others believe that by the overhead system the radiating surface is more fully utilized than in the more ordinary method. The figures given above, and many others, go to confirm the former view. It is quite likely that if the pipes are placed close under an unceiled roof the heat will produce the effects mentioned by Mr. Griggs.

In establishments where the necessary power is furnished by non-condensing engines, it is desirable to utilize the exhaust steam for heating if it is not required for other purposes. This can be accomplished very satisfactorily by a proper arrangement of the heating plant; but there have been so many failures in the use of exhaust steam for heating, that a general statement of the requirements, together with some examples of good practice, may be acceptable.

An inspection of numerous buildings where exhaust steam (supplemented occasionally by live steam) is used for heating, shows that in general the exhaust has considerable back pressure; but by paying proper attention to details, satisfactory results can be obtained without the losses arising from increased back-pressure.

There are two methods of steam heating in common use: (1) *direct radiation*, where steam is admitted

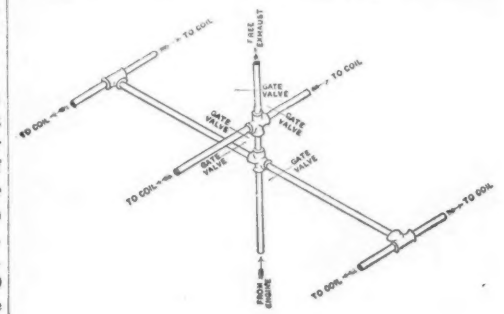


Fig. 1.

into coils or radiators located in the room to be heated, and the radiation from these coils warms the air of the room; (2) *indirect radiation*, where air passes around steam heated coils located without the room, and being heated by contact with the coils, passes into the room; the latter mode of heating being divided into two classes: (a) where the air circulates by natural draught; (b) where a mechanical draught, caused by blowers or chimneys, is employed.

It has already been stated that by a proper arrangement of pipes back pressure can be avoided when exhaust steam is used for heating. The general principle to be observed is to arrange supply and return pipes, so that their combined area is available as exhaust area, instead of carrying the steam through several coils in succession. The arrangement of pipes at the works of the Rand Drill Co., by Mr. Frederic A. Halsey, fig. 1, will give a good idea of the proper application of this principle. This figure explains itself. It will be seen that gate valves (the only kind which should be used in a heating plant) were provided at each connection for the purpose of equalizing the distribution, if required, but it was not found necessary to use them. In order to make the exhaust steam circulate through the coils instead of escaping at the free exhaust, a gate valve was fitted at this latter point, which could be closed sufficiently to secure circulation. This is preferable to loading the exhaust, since it does not increase the back pressure. The advantage of the arrangement of pipes shown is obvious, an increase in the number of coils actually giving a freer escape for the exhaust instead of choking it.

In many establishments, when an old tubular boiler is available, the method of indirect heating by exhaust

steam is the most satisfactory and cheapest which can be employed. "Sutherland," writing to the *American Machinist* (May 21, 1881), sketches a plan, fig. 2, which he has found to work well. The shop was 120 ft. long, 60 ft. wide, height not stated. An old tubular boiler *A* was placed on its side, and connected by a hood *C* to blower *B*, another hood *D* covering the opposite section orifice of the blower. *H* is the wall of the shop. The supply pipe leading from this blower was made of stove-pipe iron, 18 in. in diameter, and ran the whole length of the shop, about 10 feet above the floor. There were 12 branch pipes leading from this main pipe, to the walls and down to within 2 ft. of the floor, six on each side. Each branch pipe *y*, had a strip *z* which acted as a valve to reduce the area of the discharge orifice or close it at pleasure. The engine was 12 in. \times 24 in., and its exhaust pipe entered the boiler *A* at *F* and discharged at *G* after circulating around the tubes *i*. Cold air was drawn through these tubes, heated and discharged into the shop. The blower was arranged so that it could be run at different

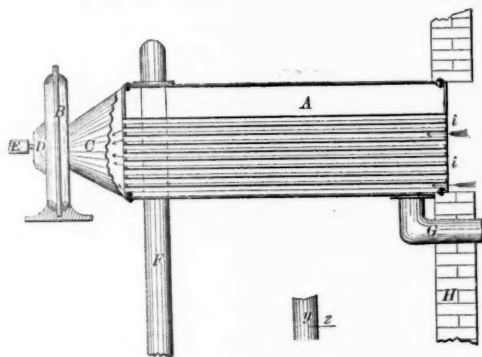


Fig. 2.

speeds according to the temperature. It was found that the branch pipes nearest the boiler discharged more air than was delivered by the pipes located at a greater distance; but by partially closing the discharge orifices of the former pipes an even distribution was obtained throughout the whole system. With the arrangement described the shop was heated to 70 deg. Fahrenheit on the coldest days, without condensing all of the exhaust, and without running the blower at the highest speed.

The method of heating by exhaust steam and mechanical draught may be applied in various ways, other than that just described. Frequently the heater is located at one end of the room and an exhaust fan at the other; so that there is a general circulation of air throughout the room without the use of delivery pipes. The system, in whatever manner it is applied, has special advantages of its own, for the reason that the condensation of steam occurs instantaneously, so that by doubling or trebling the velocity with which the air passes through the heater its heating capacity will be doubled or trebled if sufficient steam is supplied. This fact has been proven by extended experiments with a heater of the general design shown in fig. 2, it having been found that the temperature of the air after passing through the heater was always about the same whatever the quantity delivered. This method of heating, then, seems to be one of the most efficient and economical.

The foregoing remarks are principally applicable to the design of new heating plants, although it may be possible, in some cases, to reduce back pressure and render the exhaust steam more effective by rearranging the pipes according to the general plan shown in fig. 1. But other methods of increasing the efficiency of badly designed plants, where the circulation is defective and the general results unsatisfactory, may be briefly described.

The exhaust steam from an engine frequently contains so much water that its effect as a heating agent in comparison with dry steam is greatly diminished, the circulation also being less active. In such cases a forced circulation may be employed, by connecting the suction pipe of a hot-water pump to the returns, or by reheating the exhaust and re-evaporating the water before admission to the coils.

The principles here briefly detailed are sufficient for the satisfactory arrangement of heating plants for factories and shops. A few remarks about the proportions of radiating surface may be added. At the Spring Meeting of the American Society of Mechanical Engineers, 1885, Mr. Towne gave some figures drawn from his own experience and that of Mr. Briggs. He recommended that one square foot of radiating surface should be allowed for each 150 cu. ft. of space, and that the internal cross-section of

radiating pipe, for each 100 sq. ft. of radiating surface, should be as follows:

Supply (For live steam.....)	0.24 square inch.
For exhaust ".....	0.12 " "
For returns.....	0.06 " "

Adding a constant of 0.25 sq. in. to the total result in any case. These are the proportions for radiators with horizontal pipes. When vertical radiating pipes are used, the surface should be 25 per cent. greater than the above figures. Mr. Towne added that he considered the overhead system of pipes preferable.

State Regulation of Freight Rates.

As the season for legislation opens there come new propositions to give state authorities control over freight rates, but they are generally, if not always, in the direction of reducing rates, so far as the states have power to control them. This is particularly the case in western states, Iowa being the field for constant and persistent effort in this direction. It is proposed by the Iowa Railroad Commission to reduce the rates allowed for local business as nearly as possible to the low figures on the through business necessitated by competition, or by such other factors are always tending to reduce long distance charges. The Iowa Commissioners claim that the fact that through rates are made voluntarily is evidence enough that the rates named are remunerative also for local business; or in other words, that if there were no through business done the local business could be handled with profit at the average cost figure now holding for the whole traffic. Without going at all into the question of reduced revenue through the proposed tariff reduction let us see whether the low rates made to procure the through business are not an advantage to the local business as well, in allowing it to be handled at lower rates than would be the case if the roads had to depend upon it alone for revenue.

For reasons which will appear later, we shall, in this discussion, class as through freight all that which originates or ends outside of the state limits, as well as that which passes through in transit; and we shall class as local that which is carried between points in the state. Upon local freight, both originating and ending in the state, there is no question of the jurisdiction of the state authorities in regulating and reducing the rates, if so disposed; and they may, perhaps, to some extent, control rates on that either originating or ending in the state. That, however, which merely passes through the state is clearly out of the province of regulation by them, and is only affected by their action as far as interference may be made through rates covering solely a state business.

As we have said before, this through business being for long distances and meeting opposition which is only felt in part by the local business, the rates are of necessity made low, it being a question with the roads whether to take the low rates or to refuse the business. These low rates on through business offer a constant inducement to state authorities to bring the local rates down to the same level, irrespective of any difference in cost to the roads of handling the two classes of business. It may be interesting, therefore, to investigate somewhat the probable cost of doing the local business if the through business were done away with entirely.

In case the through traffic passing through the state of Iowa should be done away with, there would be of course a reduction in the total amount of yearly expenditure. There would be much difference, however, in the rate of this reduction as regards the various classes of expense, for while in the case of certain charges the decrease in total cost would be fully proportional to the reduction in traffic, thus leaving the cost of the unit per ton or per passenger one mile the same; on other items, the reduction in amount of expense being less than that in the quantity of traffic, the cost per unit would increase. There is still another class of expense items where the original expenditure would be cut down little, if any, by the reduction in amount of traffic, and consequently the cost of handling a single unit would be materially increased so far as those items are concerned.

It is safe to say that in the case of the trunk lines running across the state of Iowa, of which the Chicago & Northwestern, or the Chicago, Milwaukee & St. Paul may be considered as examples, the business passing through the state constitutes fully one-half of the traffic handled. On one or more of the trunk lines the proportion is probably over, and on others less than this average, but from what data we have the assumption of the proportion at one-half does not seem far out of the way. Without this through traffic, therefore, the business done would be reduced some 50 per cent., while the total operating expenses would be reduced in greater or less proportion, vary-

ing from items which would be lowered in full ratio to the traffic reduction, to those which would be hardly affected by such reduction. Upon certain items we may safely assume that the reduction of the traffic one-half upon a trunk line across the state would decrease the total cost correspondingly, and make no appreciable change in the cost of handling a unit of business. Such are train service and engine service, engine and car repairs, loss and damage, and probably rent of cars. Upon others, such as station and water service, telegraphing, printing and advertising, foreign agencies, insurance and general expenses, there would be a reduction in the totals but an increase in the unit cost. A business half the size of that now handled in Iowa would allow only a moderate reduction in the yearly amount spent for repairs on track and buildings, a less amount for bridge repairs and no reduction in fence repairs, thus materially increasing the unit cost, and in a greater ratio than the class last referred to.

If we assume the average cost of handling a ton of freight one mile upon the Iowa roads to be six-tenths of a cent, which is probably not far from the actual figure, a reduction of the business one-half would increase this cost fully 30 per cent., giving us a figure of over three-quarters of a cent per ton-mile. This relation would, however, show higher figures if applied to the roads of the state doing a lighter business.

We find, by the 1887 report of the Iowa Commissioners, that upon the trunk lines running through the state the average rate received for carrying a ton of freight one mile was about a cent and a tenth. While this rate per ton-mile would be a little higher if the low-rate through business were cut off, it must be remembered that the strictly local business is but a small proportion of the whole, and that business originating or ending in Iowa is about as subject to causes lowering rates as is the through traffic. In consequence, therefore, it is doubtful if the reduction of traffic we are assuming would allow of an increase in the freight rate to more than one and two-tenths of a cent per ton-mile.

The tariff which the Iowa commissioners established July 5, 1888, would materially reduce the revenue from the strictly local business, and to a certain extent that either originating or ending in the state. The figure of one and two-tenths of a cent, which we have referred to, would not afford net earnings enough, when carried at a cost of eight-tenths of a cent per ton-mile, to meet the interest and other fixed charges, not including dividends. The situation would be correspondingly worse if the business had to be done at the reduced rates desired by the Commissioners.

There is an unfortunate disposition on the part of state authorities to lose sight of the fact that the through business is becoming more and more of a factor upon all the Western lines. It is a fact (which we have referred to from time to time) that on some of the older Western roads not only are the earnings from strictly local business smaller, but the tonnage moved is actually lower than it was 20 years ago. The through business, on the contrary, has enormously increased. The argument will not hold that the reduction of plant down to the requirements of the local business will make a large decrease in the operating expenses, as we have tried to show. If the roads of Illinois and Iowa, at even the present rates, had only their local state business to depend upon, the cost of operating the simplest form of railroad would be more than the revenue earned. This is clearly shown by the invariable failures of roads in the Western states, which are built for local traffic only.

Examination of Trainmen on the C., B. & Q.

Examination of trainmen, which is recognized as important by many officers who have not been able to put it in force, inevitably suffers because it is one of those things for which an adequate direct financial return is not visible. So many ways in which money must be spent are constantly pressing for attention that reforms of this kind have to wait. The interposition of an outside influence to compel attention to them may, therefore, not always be an unmixed evil, however bad it may be.

The Chicago, Burlington & Quincy had an experience of this kind in connection with its great strike last spring. This road was, indeed, in advance of the majority in this matter, before the strike; but the sudden crisis served to bring out the importance of correct instruction as nothing else could. The training of a large body of new men showed the importance of training all of the men, and the large amount of this kind of work afforded suggestions as to the best way of doing it, which would not appear so long as only spasmodic or occasional

attention was given to it. The following interesting account of the work on the C., B. & Q. and its results has been given us by an officer of the road:

Previous to our late strike we had on our divisions an Examining Committee, consisting of trainmaster, chief train dispatcher, conductor, engineer and roundhouse foreman. To assist them with this examination we had compiled a book of questions, which embraced all questions upon time card matters, book of rules, code of signals, dispatching rules, etc. The committee was supposed to follow this list of questions very carefully, and also to add to it any questions that might occur to them not contained in the question list. But it was very difficult to get this committee together, as no one of them excepting the conductor and engineer could devote proper time to the work, their other duties taking their time so fully. After the strike, when we had to run trains with new engineers, it was found necessary to have a strict system of instruction and examination. As it was impossible at that time for the members of this committee to give their time to instruction and examination, one man, a conductor, was selected on each division, who was recognized as being particularly well posted on all rules, and the entire matter of instruction and examination was put in his hands. We commenced by allowing a number of employees to be instructed and examined at one time, in order to give all the men the necessary information as quickly as possible. We were able in this manner to get all the new engineers before the examiner several times, in company with the different groups of men; and after the men had had the advantage of instruction in this manner for about four months, we commenced rigid examinations by calling each engineer, conductor and brakeman before the examiner alone, when he was put through the entire list of questions and given a standing. We found that a large number of the men were perfect on this first examination for record. Those who were not perfect were given their proper per cent. of standing, and have since been called before the examiner and re-instructed and re-examined. The result is, that in each case there has been a very marked improvement. For instance, 100 per cent. being perfect, we found that the men in the first examination for record who stood 50, in the second examination stood 70, and in the next 80 to 90 per cent. We are still keeping up this system of instruction and examination, with one examiner on each division devoting his entire time to this work. This examiner is in close relation with the superintendent, and is thoroughly instructed about all new rules and special orders, and is, therefore, complete authority. This examiner is in communication with the train and engineers and brings before the superintendent any points which can be improved for the benefit of the service. Of course we were very particular in the selection of a man who would work conscientiously for the best interests of the company. I think we accomplish more with this one examiner than we would with a committee of several men. My experience in this committee work has been that where a committee is composed of a number of men, one or two of them do the most of the work. While any member of the committee may have a perfect understanding of the rules, he may not have the gift of imparting information or the faculty of putting questions. If a good selection is made of an instructor, and he is working closely under the advice of the superintendent, trainmaster and chief train dispatcher, I think the one man will really accomplish more than a number of men would in the same direction.

I think there is no road so small but that it could afford to employ one man as a teacher and examiner, and larger roads should certainly have one instructor for each division.

It will be observed that the salary of one man virtually covers all the expense for a division. The divisions of that road are quite large, one including 516 miles and the average being nearly 350, so that the examiners (one to each division) must, we should judge, have plenty of work. The fact that roads whose standards were among the highest under the old ideas are now the first to take measures to improve their men is significant proof of the need of radical action on the average road. Our accident record gives constant evidence of the presence of inefficient and poorly disciplined men on a great many roads, and the lessons to be derived from it do not diminish in importance as time goes on. The fact that they are general in their nature should not detract from their value. An alarming accident is as distressing on a poor road as upon a great through line, and we are not sure but it is as disgraceful.

The Long Island road has just established a Board of Examiners for trainmen, and two locomotive engineers and two conductors have been promoted to fill the places.

Mr. Adams on the Railroad Problem.

In a speech before the Commercial Club of Boston, last Saturday, Mr. Charles Francis Adams discussed the existing railroad situation at some length. He says that since the Inter-state Commerce act has been in operation, there has been "a depth of railroad morals among freight agents lower than had ever previously existed, and that is saying much." Concerning the dishonest methods of rate-cutting, he

"does not hesitate to indorse every word of the indignant denunciations of Judge Cooley," and goes so far as to say:

"It is this absence of good faith, this greed of acquisition, this turning over of business to subordinates to hack away at each other at the expense of the stockholders, which has brought the railroad system to its present low condition, and threatens to carry it still lower. To attribute it to the Inter-state Commerce act is an utter mistake. If that act were totally repealed to-morrow it would produce but a temporary and stock-jobbing relief. For a few days things might be apparently better, but they would be sure to drop heavily back again into their present bad state unless the knife of reform went deeper and cut at the root of the evils I have referred to. The railroad system must heal itself; no act of Congress, or repeal of any act of Congress, will greatly help it."

But, while not regarding the Inter-state Commerce act as the direct cause of our present troubles, he considers it a harmful piece of legislation, producing consequences from which its framers would have recoiled. It has increased rather than diminished many of the tendencies toward consolidation.

"These enactments [the pooling and short-haul clauses] struck at the very foundation of the business system under which the railroads in the country, and the country itself, had been built up, and it took some time for them to produce their results. They have of late been doing so. Under the operation of the act the smaller local railroads throughout the country are being ground out of existence. It is the long haul which brings in the profit. The smaller independent railroads cannot have the long haul, and can only be operated profitably in connection with the larger railroads. They are thus, one by one, becoming unremunerative, and being forced, whether they like it or not, into the maws of the few great systems into which the railroads of the country are rapidly crystallizing.

"So much for the practical working of a law inhibiting pooling. Next came the long and short haul clause. Just as the small local railroads are crushed out of existence by the anti-pooling clause, so the local points of distribution and second-class business centres throughout the country find themselves, because of the long and short haul clause, unable to compete with the great commercial centres. Traffic, under the provisions of the act, must inevitably seek the railroad having the long haul to the most distant and largest centres. The operation of the law in this respect is now beginning to make itself felt upon the smaller distributing points. They are deprived of their markets, for those who formerly bought of them can get the same goods on better terms from the larger and more distant centres. The old local system of distribution is broken up in favor of the centralized system. This fact is now making itself apparent to the manufacturers and jobbers of the smaller cities or towns as against Chicago, St. Louis, or Cincinnati; but, as sure as the law of gravitation applies to all places and works under all circumstances, this same long and short haul clause will next make itself felt against Chicago, St. Louis, and Cincinnati, and in favor of New York. In other words, contrary to every design of those who framed the act, its provisions have lent a new impetus to just those forces which it was intended to hold in check. Instead of building up the local road and the small distributing centre, it is working the sure destruction of both."

We need hardly say that this series of results was almost inevitable. For two years past we have predicted that the prohibition of pools would defeat its own ends, and that the long and short haul clause would simply benefit some points at the expense of others. The main point in which we disagree with Mr. Adams is where he says that it is an "utter mistake" to attribute the present crisis to the Inter-state Commerce act. We believe that it is at least a half-truth to explain it in this way; and so, we suspect, does Mr. Adams, for his proposals for improvement involve at the very outset the alteration of the act in some of its most essential features. He believes that the "railroads of the country are moving rapidly toward some great system of consolidation," and although, from his point of view, he does not regard this as a thing to be dreaded, because a consolidated corporation can be held more fully responsible than a number of independent ones, he is quite willing to see the result delayed. To do this, it is necessary to modify the law in such a way as to make united action by separate companies possible.

"A well-devised railroad clearing-house scheme would prove in practice, whether so intended or not, in the direct line of the enforcement of the Inter-state Commerce act in all its better features, and it has many such. That rates can in these days and this country long be more than reasonable, I do not believe. A reasonable system of railroad rates, publicly announced, equal to all and honestly maintained, is the commercial need of the day; and not less so for the community of business men than for the railroads themselves. This was one of the results which it was hoped the Inter-state Commerce act would bring about when, two years ago, it went into effect. In practice it has only aggravated the evils it was intended to remedy. In my belief it cannot produce any other result until the railroads themselves co-operate with the act, and they cannot co-operate until they are brought together in one responsible organization to enforce its provisions.

"If, therefore, I were asked for concrete propositions embodying the measures most likely to work an important and desirable reform in the railroad situation, I would say: Delay, at least for a time, the present too rapid tendency toward crystallization or consolidation by repealing the feature of the Inter-state Commerce Act which are precipitating events in that direction. If the anti-pooling provisions of the act may not be wholly repealed, let them, at least, be so modified that contracts made among railroads, subject to the approval of the Inter-state Commerce Commission, for the division of competitive traffic at reasonable rates, may be binding in law. Then, more and most of all, encourage and facilitate any movement among those interested which will tend to raise the standard of commercial morality in railroad circles, and be assured nothing will tend more directly and immediately to that result than the organization of the railroads into some public and recognized clearing-house system through which the traffic management of the country can be taken out of the hands of irresponsible subordinates who now so vilely abuse it, and restored to those who should be responsible, in fact as well as in name, for the companies of which they are the heads."

That such a result would be in the highest degree desirable we fully believe. We wish we could believe that there was some immediate prospect of such changes in the law as are here suggested.

November Accidents.

Our record of train accidents in November, given in this number, includes 71 collisions, 70 derailments and 4 other accidents; a total of 145 accidents, in which 38 persons were killed and 179 injured.

These accidents are classified as follows:

COLLISIONS:		
Rear.....	40	
Butting.....	21	
Crossing and miscellaneous.....	10	71
DERAILMENTS:		
Broken rail.....	4	
Loose or spread rail.....	4	
Broken bridge.....	3	
Defective switch.....	2	
Broken wheel.....	3	
Loose wheel.....	1	
Broken axle.....	1	
Broken truck.....	2	
Loose dead-block.....	1	
Misplaced switch.....	6	
Bad loading.....	1	
Bad switching.....	2	
Negligent trackmen.....	1	
Cattle on track.....	5	
Land-slide.....	1	
Flood over track.....	1	
Malicious obstruction.....	2	
Unexplained.....	30	70
OTHER ACCIDENTS:		
Cars burned while running.....	1	
Broken parallel rod.....	1	
Broken piston rod.....	1	
Broken truck.....	1	4

Total number of accidents..... 145

The causes of collisions where given were as follows:

	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two.....	7	1	2	10
Misplaced switch.....	1	2	2	5
Failure to give or observe signal.....	1	1	1	3
Mistake in giving or understanding orders.....	6	5	1	12
Miscellaneous.....	6	1	2	9
Unexplained.....	23	13	5	41
Total.....	40	21	10	71

A general classification shows:

	Col-lisions.	Derail-ments.	Other.	Total.	P. c.
Defects of road.....	7	13	3	23	16
Defects of equipment.....	7	7	3	17	12
Negligence in operating.....	23	11	34	68	47
Unforeseen obstructions.....	1	9	9	19	13
Unexplained.....	41	30	1	72	50
Total.....	71	70	4	145	100

The number of trains involved is as follows:

	Col-lisions.	Derail-ments.	Other.	Total.	P. c.
Passenger.....	29	19	3	51	35
Freight and other.....	102	51	1	154	105
Total.....	131	70	4	205	100

The casualties may be divided as follows:

	Col-lisions.	Derail-ments.	Other.	Total.	P. c.
Killed.....	19	6	3	28	19
Employés.....	1	5	6	12	8
Passengers.....	6	1	7	14	9
Others.....	6	1	7	14	9
Total.....	26	12	3	41	28
Injured.....	61	45	2	108	74
Employés.....	15	51	2	68	47
Passengers.....	5	5	5	15	10
Others.....	5	5	5	15	10
Total.....	76	101	2	179	100

Twenty accidents caused the death of one or more persons, and 46 caused injury but not death, leaving 79 (54 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with November, 1887, shows:

	1888.	1887.
Rear collisions.....	40	52
Butting ".....	21	19
Crossing and other.....	10	2
Derailments.....	70	48
Other accidents.....	4	4
Total.....	145	125
Employés killed.....	28	38
Others ".....	13	5
Employés injured.....	106	87
Others ".....	73	18
Passenger trains involved.....	51	36

Average per day:

Accidents.....	4.83	4.17
Killed.....	1.27	1.43
Injured.....	5.97	3.50

Average per accident:

Killed.....	0.262	0.344
Injured.....	1.233	0.480

Rear collisions constitute the most noteworthy class of

accidents this month. A large share of the accidents under this head every month result, undoubtedly, from the stoppage or slackening of a train on the open road where either the following train is too close to it or the flagman is lazy about getting back; but in most cases we cannot state this explicitly for lack of full information. This month there are nine cases—about one every third day—where a train was stopped by a disabled engine or other sudden and unexpected cause and a following train came up behind and caused much damage. It hardly seems likely that all these nine trains were followed too closely, and at first thought one would say that the flagman probably had enough time to give an effectual signal, but failed to improve it; but again, when we reflect that there are hundreds of these emergency stoppages which occur to trains with 25 or 50 miles of clear track behind them and so entail no damage and are never heard of, it is apparent that even so large a number as nine may still be but a small proportion of the total number of emergency stops. The brakemen as a whole, therefore, may be no worse than the engineers. A noticeable feature of rear collision records is the number of cases happening on roads whose traffic is so small that one wonders how two trains ever happened to be upon the road at the same time. But the explanation lies, of course, in the fact that the very thinness of the traffic engenders habits amongst the men which all the more quickly involve them in trouble when a little rush does come. It is as certain as any inferential reasoning can be that such habits must be very common, and that if a road disgraced by this sort of accidents has a rule to go back regardless of whether any train is due or not, that rule must be constantly violated. If left to themselves trainmen will modify their action according to the nature of the train behind them and its nearness. If it is desired to have them faithfully obedient to the rule they must be watched and trained by a person outside their ranks, whose feeling of self interest does not come in to warp his judgment, or at least will warp it in the opposite direction.

The rear collision at Fishkill, N. Y., on the 8th illustrates the advantages of automatic signals. The freight train was, however, following too closely behind the passenger and the discipline at the station appears to have been poor. And even were electric signals unknown, the difference between signals whose normal position is danger and those whose value depends wholly upon a man's faithfulness in pulling them occasionally is here clearly shown.

The butting collision on the Denver & Rio Grande, the 26th, was undoubtedly caused by a mistake in orders, but the exact facts have not been shown. Another Rock Island train met with a serious mishap from a misplaced switch on the same line soon after. The Denver & Rio Grande is apparently running a large number of important trains over a line not equipped in the best manner for a heavy traffic.

The number of freight wrecks that took fire from caboose stoves or otherwise, was fully up to the average in November, and they were supplemented by a serious fire in a Pullman car. Nearly a whole passenger train was burnt up in Georgia. Those railroad officers who never heard of fires in cars will have to revise their standards soon, we fear.

The crossing collision on the Brooklyn Elevated deserves notice by reason of the heavy traffic, present and prospective, of the line. It was claimed that the interlocking mechanism of the signals was at fault and it was even published that the company had not decided to permanently operate its lines in such a way as to require a grade crossing at the place where the collision occurred and that the kind of signals to be used had not been settled upon. But the signals appear to have been in good order, and we understand the engineer at fault. He says he knew the signal was against and that he does not know why he disregarded it. The statement that he had been up all night with a sick member of his family throws an interesting side light on the question of his vigilance. The effect of moderate weariness upon a person's brain and nerves is an indefinite factor, and for that very reason arguments tending to show the danger of sleepy men running engines are seldom squarely met and are generally answered by statements that are conclusive (to those offering them, at least) in favor of continuing the trust-to-luck policy.

The most fatal passenger train accident of the month was in Georgia, but we have no definite information concerning its cause.

We print in another column of this issue an incisive utterance from the Massachusetts Commissioners on the cause of an accident that occurred in that state last July.

The United States Senate Committee on Education and Labor gave a hearing on Dec. 13 to representatives of the "Sabbath Union" on Senator Blair's bill, introduced last May, for "securing to the people the enjoyment of the first day of the week as a day of rest." This bill, it will be remembered, embodies the usual prohibitions of labor, etc., on Sunday in all places subject to the exclusive jurisdiction of the United States; prohibits transportation, collection and delivery of mail, and the conduct of inter-state commerce on that day, with certain exceptions, under penalty of from \$10 to \$1,000.

The delegation was introduced by the Rev. W. F. Crafts, of New York City, who presented numerous documents bearing on the subject. He states that the petitions for the passage of the bill represent 14,000,000 persons. Mr. A. S. Diven, of Elmira, N. Y., formerly Vice-President of the Erie, was one of the speakers. He would abolish all Sunday railroad traffic, having transcontinental passengers stop over Sunday on the road at the expense of the railroad companies. Milk trains should reach their destination by Saturday night

or wait until late Sunday night. Sunday mail trains are unnecessary, as the telegraph is resorted to in case of emergency. Numerous other speakers, representing various churches and other organizations, spoke in favor of the bill, but the Seventh Day Baptists, Seventh Day Adventists and Jews were represented by advocates who opposed it unless they could be exempted.

The practical and important points bearing on the subject, so far as railroad traffic is concerned, received little consideration, judging from the reports. The relations of railroads to each other and to the public in the matter of Sunday traffic somewhat resemble their attitude on competitive rates. Each road wants to maintain rates, but finds itself obliged to cut and to fight because others do. Likewise officers, generally, avow themselves opposed to Sunday trains, but say that they must run them because their competitors do. The public certainly demands some Sunday trains, and we presume these petitioners would be measurably satisfied with a substantial diminution of Sunday work considerably short of their present demands. But securing a day of rest to employees, which is one of the principal points advanced in favor of a Sunday law, can hardly be said to be within the power of the employer, so long as many of the men are only too anxious to work seven days in the week. Men who work on Sunday will not rest on Wednesday, and this is especially the case with trainmen who are paid by the trip. The most that the companies can do is to see that every man has the free privilege of staying at home one day of the seven. Many roads are at fault in this respect, in that the "emergencies" which are supposed to justify extra work are so frequent that there comes to be one continuous "emergency" for months. The argument for not running trains on Sunday lies in the fact that the great majority of most communities wish that day to be kept quiet. This is a question of police power, and the desired object would seem to be most easily attainable by effort in that direction. The present Connecticut law is framed in this spirit and seems to be satisfactory. No one questions that it applies to inter-state as well as intra-state traffic. Moreover, the recent decision of the United States Supreme Court in the Alabama color-blind case again confirms the power of the individual states to control inter-state commerce in any feature which may be included in the term "police regulation," and a pretty broad meaning is given to the phrase.

The widespread storm of Monday last, which was in the form of snow in central New York and north of there, and of rain further south, did serious damage to railroads as well as other property in many localities. A cut on the western approach of the Poughkeepsie Bridge was filled with a great quantity of mud and an engine and several cars were ditched. The Mohawk and Hudson rivers rose very rapidly. Trains on the New York Central and other roads in Northern New York were delayed from two to seven hours. At Scranton, Pa., the tracks of the Central of New Jersey were washed out for some distance and a bridge was carried off. The new line of the Lehigh Valley between Pittston and Fairview, Pa., was badly damaged. A number of bridges were weakened and the washouts are so serious that traffic will have to be suspended for some time. In the region of Montreal and Quebec the storm was a regular blizzard and trains were delayed a whole day. A New York & New England passenger train was derailed by a washout at East Thompson, Conn. At the east portal of the Hoosac Tunnel, on the Fitchburg road, an iron bridge was in process of construction, the track being run around on a temporary trestle. The latter was completely carried away by ice. The Old Colony had a slight landslide near Canton, Mass. The Central Massachusetts was washed out near Oakdale. The Windsor & Annapolis Railroad bridge at Cambridge, N. S., was carried away by the breaking of three dams up the stream. At Hookset, N. H., three wooden bridges spanning the Merrimac River on the Suncook branch of the Concord were undergoing repairs, and on account of the ice and high water were braced with timbers. On Wednesday forenoon a gang of men were at work on the middle bridge when it suddenly began to move, precipitating the bridge and 11 men over the falls and into the water. Three men were drowned and the remaining eight were rescued in an injured condition.

The New York & New England announces that in consequence of the loss of the transfer steamer "Maryland," the Boston and Washington express train, beginning Sunday next, will leave Boston at 6 p. m., and run over the New York & New England to Fishkill, where it will be transferred by boat to Newburgh, thence running over the New York, Lake Erie & Western to Jersey City, where it will reach the Pennsylvania Railroad and continue by its old route to Philadelphia, Baltimore and Washington. The time-table through is not given, but by good management and few stops the train ought to reach Jersey City by 4:45 a. m., which is, we believe, the time it now leaves there. The time of arrival at Harlem River was 2 a. m., but the time allowed for the boat transfer was very long. The distance to Jersey City by the new route is about 293 miles, viz.: Boston to Hartford, 117; Hartford to Fishkill, 111; Fishkill to Newburgh, 1; Newburgh to Jersey City, 63; transfer to Pennsylvania Railroad, 1. This is about 61 miles longer than the old route, but if the river transfer can be made in a half hour the average running time west of Hartford need not be over 27 miles an hour. In fact the train might leave Boston at the old time, 7 o'clock, and reach Jersey City as early as formerly by running about 33 miles an hour west of Hartford. The West Shore, from Newburgh to Jersey City, is

only about 5 miles shorter than the Erie, and, moreover, is at present blocked by the collapsed tunnel at West Point.

Of the new men employed as switchmen at Indianapolis in the place of the late strikers two have been killed and several have been injured in coupling and otherwise. There is a sort of grim parallelism between this contest and its results, and the sanguinary contests of the battlefield. The wrongfulness of employing any but well-trained men in regular switching work is well understood, but the desperate conditions of the fight with the strikers were doubtless held to justify extreme measures, just as the taking of a fort necessitates and warrants the exposure of men. But the whole affair emphasizes the need of great care in engaging brakemen. The hiring of men for this work, which to be done well certainly requires men of experience, is often done after the method employed in the employment of Italian shovelers. The freedom from accident on the Chicago, Burlington & Quincy when the company put on several hundred new engineers at short notice was remarkable and showed that the officers had a true appreciation of their responsibility. There is a similar responsibility, hardly less important, in setting new brakemen at work. The Indianapolis cases may, indeed, have been exceptional; but of the casualties to brakemen chronicled in the newspapers from week to week a significantly large number happen to very young men, and even boys, who have been at the work but a short time. Do employers do their whole duty to these ignorant beginners?

The manager of the Timlin-Heidinger Company writes us as follows concerning the description of that system published in the *Railroad Gazette* Dec. 7:

"In the description of the cut of our device I note an important omission in the failure to mention the fact that the furnace under the storage chamber (which acts as a steam storage chamber when attached to the engine, and a water storage chamber for use as an independent heater when detached from the engine) is so constructed that coal or coke may be used instead of gas. In other words, roads not desiring the gas can have a complete equipment for heating by dry steam stored direct from the engine, and when the independent heater is a necessity use coal or coke for fuel."

A collision at Washington Court House, Ohio, reported in our issue of Nov. 30, was erroneously given as having involved a freight train of the Ohio & Mississippi road. As the proofreader cannot be made to bear geographical mistakes, the geographical editor will have to own up to a blunder. Every one knows, of course, that the O. & M. does not touch the town named.

NEW PUBLICATIONS.

Alfred Krupp, a Sketch of His Life and Work. By Victor Niemeyer. Translated by K. W. and O. E. Michaelis. With portrait and illustrations. Thomas Frosser & Son, New York, 1888.

The direct train of circumstances which made Alfred Krupp a steel maker began in 1800, twelve years before his birth. In that year his great-grandmother, a widow, purchased the Good Hope iron works at Sterkrade. It was here that Frederick Krupp began his life work, and made his first experiments toward the production of cast-steel. He is spoken of as a man of iron will, self-denying and austere. He learned to make cast-steel, but was commercially unsuccessful, and died at 39, leaving to his son Alfred, then but 14 years old, the precious secret which had cost him his fortune and his life. The son succeeded at once to the management of the works at Essen. Two workmen were employed at the time; in six years the number was increased to ten. Young Krupp toiled at the forge with his men, and for 15 years earned just enough to pay their wages. For years his days were given up to hard manual labor, and his evenings and Sundays to study; and his food and manner of life were the same as those of the workmen around him.

Twenty-two years after Alfred Krupp succeeded to the charge of the works but 72 workmen were employed. Just at that period in his career, however, he suddenly began to reap the fruit of his heroic toil and of his genius, and in the next 10 years the number of his workmen increased to 1,047. It was at about this time, 25 years after he took up his father's work, and when he had reached the age at which his father died, that Krupp astonished the world by showing at the London Exhibition of 1851 a cast-steel block weighing 45 hundred-weight, and his biographer says "at a touch his world-wide reputation was established." In 1852 he invented his weldless tire for railroad vehicles; and wheels, tires and other railroad supplies at once became the principal output of the works. From this time there was no more question of Krupp's success. The only possible question was as to the degree of that success. He rapidly became one of the greatest employers of labor of the world; and his history is an important part of the industrial history of the century. It is not necessary to reprint here figures, which in the last year have become widely known, showing the vast proportions to which the Krupp works grew, and the thousands of people to whom those works gave employment. But we desire to call attention to one part of his work which is not so well known, that is, the constant and intelligent attention which he paid to the welfare of his employees. From the day when the rapid development of his business began, began also his provisions for the help, instruction and prosperity of the workmen. He established a sick and pension fund, and a system of accident insurance. He built stores, factories and markets for the supply of food, clothing, mineral water and beer, at cost and for cash. He built workmen's houses for families and established boarding houses

for the unmarried. He also organized schools, hospitals and bathing establishments. The schools include industrial and evening schools. His benefactions to his people did not end with his death, for he left a legacy of 1,000,000 marks to be used for the benefit of all workmen connected with the establishment, and to the city of Essen he left 500,000 marks to be used for charitable purposes. It would be too sweeping to say that the employers who show most sympathy with the workmen are those who have never known personally the hard side of a workman's life. But this is often enough the case to tempt one to say that as a rule the hardest masters are the men who have come up from the shops. It is therefore the more noteworthy that through all of Krupp's hard fight for existence he kept a tender and generous heart.

Till the end of his marvelous career, and in spite of the fortune and honors which came to him, he kept much of his simplicity of life and manner. He declined a title, avoided politics, and has left behind him the memory of a simple, unostentatious and beneficent life.

Scribner's for January has an article by General E. P. Alexander, entitled "Railway Management," and it can safely be called one of the very best of the series of railroad articles. The writer outlines the organization of a railroad under five heads: care of the property; handling trains; making rates and soliciting business; collecting revenue and keeping statistics; and the custody and disbursement of revenue. He presents briefly and very clearly the titles and functions of the various officers of these departments. While giving the non-technical reader much interesting information in an attractive way, General Alexander gives him also, from the wealth of his knowledge, some wholesome instruction on the relations of railroads to each other and to the public. In this way he touches on some of the intricacies of rates and the abuses of commissions, and he mentions incidentally one practice which "is unfair at the best, and is the source of many abuses;" that is, charging the same fare to a man without baggage as to the man with a Saratoga trunk. He tells of the case of a merchant who by bribing the baggage man checked 20 trunks full of merchandise 1,000 miles, and himself traveled by another route. This is one of those evils which the public thinks of as a blessing, and any attempt to do away with it would probably be stoutly opposed by the travelers themselves, notwithstanding the obvious absurdity of making 20 men with valises help pay for carrying the 20 trunks of one drummer. It need hardly be said that General Alexander considers paying commissions as against public policy, and that he explains the ultimate public benefit that must frequently come from paying more for the short than for the long haul. He has a few suggestive sentences also on the subjects of consolidation and of pooling. On the whole, it is fortunate for all that the topics included in this paper should have been given to the great audience of *Scribner's* so attractively and so justly.

Tire Breakages on German Railroads.

In the *Railroad Gazette* of July 15, 1887, was published a very elaborate paper giving the results of the investigations of the German Railroad Union into the subject of tire breakages for the year 1886 and preceding years. In that paper were shown the various tire fastenings used in Germany, and a mass of valuable comparative statistics was collected.

According to the returns for 1887, lately published, there were 3,552 tires broken in that year upon 37,400 kilometres of lines opened, which belonged to 33 different systems. For every 1,000 kilometres of single line there were 70 broken tires against 69 in 1886, and 84 per 100,000,000 axle-kilometres against 47 in 1885. Of the above total, 2,582 cases occurred in the winter and 970 in the summer months, the corresponding numbers being 3,380 and 1,360 in the year 1886. The notable reduction of breakage in the summer of last year leads to the conclusion that a great diminution of this class of accident had actually taken place. The results for the summer months over several years are as follows: 1884, 1,580; 1885, 1,433; 1886, 1,360; 1887, 970.

Of the above total, 395 cases were discovered immediately, but in most of the other cases the fracture was not seen until the broken wheel had traveled a greater or less distance from the site of the accident. There were 20 cases of derailment, and 191 trains were delayed in consequence of these accidents.

The distribution according to the class of train was: Mail and express trains, 144; ordinary passenger trains, 472; mixed passenger trains, 135; goods and ballast trains, 2,016; shunting trains, 98; empty trains, 84. In 693 cases the class of train could not be determined. The number of times that the wheel-centres had been re-tired was determined in 2,881 cases, or 81.11 per cent. of the whole, when it was found that in

504 disks and 1,288 star-centre wheels had their first	tires.
95 " 217 " " " " " " " " " " " "	second " "
1 " 63 " " " " " " " " " " " "	third " "
20 " 20 " " " " " " " " " " " "	fourth " "
7 " 7 " " " " " " " " " " " "	fifth " "
3 " 3 " " " " " " " " " " " "	sixth " "
1 " 1 " " " " " " " " " " " "	seventh " "
	eighth " "

For each solid disk-centre wheel broken the breakages in radial armed wheels were: At first use, 0.6; at second use, 1.76; at third use, 6.03; at fourth use, 16.5. The fractured surfaces in 1,882 cases (52.99 per cent.) showed sound material, in 1,213 cases (34.15 per cent.) defective material, and 73 cases (2.05 per cent.) imperfect welding. In 2,173 cases the fractures were fresh, and in 985 old. The cases of the fractures are arranged as follows:

Flaws in material of all kinds	1,391	Percent.
Low temperature and changes of temperature	488	35.16
Brittle material	485	34.85
Causes not assignable	418	30.00

The largest numerical proportions of breakages was in the wheels of tenders, or 0.53 per cent. of the whole number of the tender-wheels actually in use, the others being in the following rates: Locomotive wheels, 0.47 per cent.; post-office carriages, 0.38 per cent.; passenger coaches, 0.35 per cent.; luggage vans, 0.33 per cent.; and goods wagons, 0.22 per cent. More than one-third of all the tires in use, or 459,872

out of 1,380,097, were subject to the action of brakes. The breakages per 10,000 tires in use were:

	1887.	1886.	1885.	1884.
Brake wheels	27	34	34	27
Ordinary wheels	23	32	25	20

In 1887 the number of tires made of cast steel in various forms was increased by 4.52 per cent., from 635,621 to 673,381, while those of puddled steel diminished 14.27 per cent., from 157,015 to 134,615, and those of wrought-iron 6.16 per cent., from 65,924 to 61,863. As in former years, the largest proportion of breakages was with puddled steel tires, being 0.58 per cent. of the total number in use, with iron it was 0.36 per cent., and with cast steel of all kinds only 0.25 per cent. Since 1884 the thickness of new tires has been largely increased, the number in use at the end of each year, classified according to thickness, being as follows:

	Above 60 milli-metres.	50-60 milli-metres.	40-50 milli-metres.	35-40 milli-metres.	30-35 milli-metres.	25-30 milli-metres.	20-25 milli-metres.	10 and below.	20 mm. and below.
1884.	153,000	239,000	223,000	114,000	79,000	49,000	19,000	2,000	2,000
1885.	186,000	273,000	250,000	131,000	85,000	50,000	18,000	2,000	2,000
1886.	205,000	318,000	283,000	142,000	91,000	50,000	14,000	1,000	1,000
1887.	221,000	328,000	288,000	141,000	88,000	49,000	12,000	600	600

The number of breakages diminishes notably with increased thickness in the tires. In 1887 it was 1.88 per cent. of those between 20 and 25 millimetres thick, while it was only 0.01 per cent. of those above 60 millimetres thick.—*Proc. Inst. Civil Engineers.*

Sink Holes.

In regard to sink holes which have recently caused much trouble on some Minnesota roads, a recent number of the *Northwestern Railroaders* publishes interviews with officials of various companies. Mr. Geo. F. Copeland, Assistant Superintendent St. Paul & Duluth, in speaking of oncoming trouble now on his road said: When the road was first built, a train could not be taken across for over a month. I think we have at last touched bottom, as there has been no sinking of track in the past two days. We have dumped over 1,200 car loads of earth into it since trouble began. We had two others a little north of this one but not as bad. The worst taking about 800 car loads to fill. As the track went down, the swamp at the sides of the roadbed was raised about 6 ft. above the track, and ties piled along the road were tipped on end. Where the last hole broke through 25 ft. of water was found.

Mr. C. Shields, General Superintendent Chicago, St. Paul & Kansas City, said: The Canadian Pacific had a great deal of trouble near Lake Superior. The track sank in several places, but is solid now. At one place, on the lake shore, the earth placed in the sink discolored the water over half a mile from the shore. To shut off this underground connection, piles were driven at two points.

Mr. W. B. Hixon, Superintendent of Bridges Minneapolis & St. Louis, said: We have had a great many sink holes, and some troubled us for a long time. The first one, in 1877, was on the main line, 11 miles out, between Eden Prairie and Hopkins. There was a pile bridge between 150 and 200 ft. long which was shaky at the crossing, and it was necessary to fill or build a new bridge. The superintendent ordered the hole to be filled. The bridge was 3 ft. above water but sank until the rails were underneath. A push car crew worked 6 months to make the fill. The roadbed is now solid, but no higher than at first. In a hole near Albert Lea which we undertook to fill, as fast as the dirt was put in it sank, until instead of a fill of from 8 to 10 ft. the roadbed passed through a cut 4 ft. in depth caused by earth squeezing up on either side of track. This is also solid now and does not trouble us. At a point between Minneapolis and Lake Minnetonka we filled a hole with trees, old ties, car timber and dirt. We kept trains running and worked for several weeks until we had something to build on, then we filled it up with cinders, which is the best material for the purpose that I know of, as it gives the minimum of weight in fill. On the St. Paul & Duluth between Minneapolis and White Bear, near Little Canada, I rebuilt a bridge. We filled the hole with immense quantities of logs and timber, some of which came up 250 or 300 ft. from where they were put in. Finally we despaired of filling the hole and started to put in a pile bridge. We drove spliced piles 150 ft. long.

Mr. J. W. Kendrick, Chief Engineer Northern Pacific, says he has had but little trouble from this cause. The best way to deal with such places is to make a mat foundation of trees and brush, which forms a raft, to carry the road. The objection to piling is that, usually, the holes are too deep and piling long enough cannot be easily secured.

TECHNICAL.

Car Notes.

The Harrisburg Car Manufacturing Co. has this year constructed nearly 1,700 freight cars.

The Laclede Car Co., of St. Louis, has received the contract for building 60 new cable cars for a St. Paul cable railroad.

The Kansas City Car & Wheel Works, at Randolph, Mo., have a contract to build 250 cars.

The Central of Georgia will shortly ask bids for 2,000 freight cars, of which 1,000 will be box and 1,000 fruit cars. The contracts for the 2,000 freight cars for the western lines of the Pennsylvania, noted last week, have been let as follows: To the Ohio Falls Car Co., of Jeffersonville, Ind., 1,000 box; to the Missouri Car & Foundry Co., of St. Louis, 500 stock, and to the Peninsular Car Co., of Detroit, 500 gondola.

The Canada Atlantic has under contract 200 platform cars.

Of the 500 cars of the Louisville, St. Louis & Texas 10 are passenger and baggage cars, and were made by the Jackson & Sharp Co., Wilmington, Del. The freight cars include 300 box, 100 coal, 130 platform and 50 stock cars.

The St. Charles Car Co., St. Charles, Mo., proposes to increase the capital stock of the company to \$1,000,000 and to erect new shops and to otherwise extend their facilities for building cars. The company has just built two vestibule cars for the Kansas City, Fort Scott & Memphis. The main parts of the cars are finished in Mexican mahogany elaborately carved. Each car is equipped with the Johnston chairs and Globe ventilators.

Locomotive Building.

The statement that the Taunton Locomotive Manufacturing Co., of Taunton, Mass., is going out of business is entirely erroneous. Instead of this the company is preparing to go into business more vigorously and on a larger scale than ever before.

The Cooke Locomotive & Machine Works have shipped the past week two consolidation freight engines to the Chesapeake

& Ohio. They have received from the Central of New Jersey a contract for 25 Wootton consolidation freight engines.

The Richmond Locomotive & Machine Works are rapidly developing their already extensive works with a view to placing themselves in a position to build at least 100 locomotives a year. They have contracted for a large number of new tools and are making considerable extensions in their various shops. They expect to have all their alterations completed by May, 1889, and be prepared to give prompt attention to all orders.

The Wabash road has built this year five locomotives at its own shops and has now nearly completed the sixth one.

The nine locomotives of the Louisville, St. Louis & Texas road have 17 x 24 in. cylinders and were made at the Pittsburgh Locomotive and Car Works.

The Rogers Locomotive Works have shipped this week a Standard passenger locomotive to Cuba; also one to Nova Scotia. They have about ready for shipment two for the Nashville, Chattanooga & St. Louis. These latter are equipped with the Lüttgens variable exhaust damper.

Bridge Notes.

On the Louisville, St. Louis & Texas, which has just been completed, there is a bridge over Green River 500 ft. long, with a draw span of 260 ft., and an iron viaduct over Doe Run 1,400 ft. long and 120 ft. high. The latter cost about \$100,000.

In the extension of the Louisville Southern from Lawrenceburg to Lexington, Ky., a cantilever bridge will be built over the Kentucky River, near Tyrone, which will be about 250 ft. high, with a main span 525 ft. cantilever, 300 ft. suspended span in centre.

The draw of the new iron bridge over the Pequonnock River, at Bridgeport, Conn., built by Dean & Westbrook, of New York, is to be operated by an electric motor beneath the structure, the current to be furnished by the Bridgeport Electric Light Company.

A dispatch from St. Louis says the Merchants' Bridge project is a success, and that the entire sum considered necessary to carry the project out—\$11,500,000—has been pledged, and that work on the bridge will begin early in the spring. The scheme is to construct a railroad and wagon-way across the Mississippi River at some point north of the present bridge, and within easy reach of the centre of the city and the terminals of the railroads centering in St. Louis.

The California Bridge Co., of San Francisco, is building three iron bridges for Los Angeles, Cal.

The Philadelphia & Reading is building two new iron bridges at Wayne Junction, Pa., on the Germantown branch. The bridges are through girder, with each girder 85 ft. long.

The Riverside Bridge Co. has the contract for building a bridge between Kearney and Newark, N. J.

It is proposed to build a bridge across Penn River at Weissport, Pa., at a cost of about \$10,000.

The contract for the superstructure for the new bridge over the canal at Chicopee Falls, Mass., has been let to the R. F. Hawkins Iron Works, of Springfield.

Manufacturing and Business.

The American Railway Equipment Co., Limited, has removed its office from 45 Broadway to 68 John street, New York, where, in connection with its present business, the company will represent the Crosby Steam Gage & Valve Co., of Boston, as managers of their New York branch.

The foundry of the new car shops at Centropolis will begin working this week, and as soon as the other buildings are completed the full force of 600 will be put to work.

The Cincinnati, Jackson & Mackinaw has contracted with the Indianapolis Car Works for 1,500 car wheels, to be delivered in the coming six months, as needed.

Iron and Steel.

The Ellis & Lessig Steel & Iron Co. have commenced work on a new building for the 8 new furnaces to be erected by them, at Pottstown, Pa.

The furnaces of the Vulcan Steel Works, at Carondelet, Mo., will soon resume operations. As soon as they are in blast, which will be probably the middle of January, the rail department will be started up.

The Central Iron & Steel Co., of Brazil, Ind., will hereafter manufacture turn-buckles used by bridge builders and others. This new department consists of a train of rolls, with the heating furnaces, four presses, a special machine with six spindles to tap the buckles right and left, a large bolt cutter, lathes, etc., and is under the special management of Mr. Williams, formerly with the Cleveland Forge Co.

The Clapp Griffith furnace at Graff, Bennett & Co.'s Millvale mill, recently purchased by Scott & McLan, iron and steel brokers, has been sold to the Mexican Iron Co., whose works are at Durango, Mexico. This furnace was built by James P. Witherow & Co.

The Vulcan Iron Works, of Chicago, have been awarded by the Navy Department the contract for 18 steel shafts and crank shafts for the U. S. Monitor Monitor, now being rebuilt in San Francisco, at their bid of \$7,290.

Bids were opened at the Ordnance Bureau, War Department, at Washington, on Dec. 15 for 27 cast iron bodies for 12-in. mortars; for finishing and assembling the same, and for 27 sets of steel forgings for trunnion hoops and breech mechanism for the same. The bids were as follows: R. Wetherill & Co., of Chester, Pa., for finishing, \$8,500, or for manufacture complete, \$20,500; South Boston Iron Works, for bodies, \$2,750, and for finishing, \$4,250; West Point Foundry Co. made the same bid; Builders' Iron Foundry, Providence, R. I., for bodies, \$1,475; Radial Drill Co., of Cincinnati, for bodies, \$2,850; Bethlehem Iron Co., Bethlehem, Pa., for steel mortar forgings, \$5,496 per set; Midvale Steel Co., of Philadelphia, for steel mortar forgings, \$2,770 per set.

The Rail Market.

Steel Rails.—Outside of small lots aggregating about 8,000 tons, and at private terms, no sales in the East are reported. There is some inquiry from the South, and some of these orders may be secured for the East if the Western mills maintain their present price. The order for 17,000 tons for the Union Pacific taken last week by the North Chicago Rolling Mill Co. was transferred to them by the Carnegie works.

Old Rails.—No business is reported, the present supply being held at a high price. For shipment early next year quotations for foreign double heads are \$23 75 at New York.

Track Fastenings.—A Western road has recently been sold a lot of 5,000 kegs of spikes at a price not mentioned. Angle plates are weakening.

The Rotary Snow Shovel.

The Canadian Pacific has now in service four Leslie Rotary Snow Shovels built at the shops of that company this year. Their engines have 17 x 24 in. cylinders. The diameter of the knife wheel is 10 ft., and the casing 11 ft. 4 in.

This week the Cooke Locomotive Works shipped three of the "rotaries" to Western roads.

The picture was realistic to a degree. Even the alligator was not wanting. The animal disported himself at pleasure about the float, and was frequently in telephonic communication with the polar bear at the other end—truly a speaking tribute to the progress which modern science has made. The realistic effect of the display was completed by a coating of the most natural-looking snow upon the roof of the car at the end contiguous to the ice float, while at the other end of the coach, which was supposed to be well into the state of Florida, there were tourists with straw hats and linen dusters.

A Libelous Pun.

A western house air break—a cyclone. This comes from an "Exchange" of one of the papers coming to this office, but it must have originated in the effete east.

Dogmatism in Railroadings.

A Southern exchange has discovered a station master who is assisted in his duties by a small, long haired black and tan dog, for whose accommodation a little platform has been erected, where he takes his stand with flag in mouth. He is well known to all engineers and conductors, and his signals are always obeyed. He is sent out to flag trains, but displays original talent in watching a deep rock cut near the station. The dog is ever on the watch, especially at night. It he hears an unusual sound, such as that produced by the falling of a stone, he leaves the little sentry box which has been erected for his convenience and comfort, walks leisurely up the road, carefully examining if anything is on the track that would endanger the train, and if any object of the kind is discovered, goes to the old flagman, wakes him up if he happens to be asleep and conducts him to the point of danger. Our contemporary adds that this is no fiction, and can be vouched for by many who have witnessed these performances. But for this assurance some might be skeptical.

Welsh Railroads.

Referring to a proposed consolidation, or amalgamation as it is called over there, of the Welsh railroads, the *Financial Times* says there are twenty-four of them, with a total mileage of 540 miles, and a capital of £14,000,000, administered by eighty directors, presumably drawing substantial fees, each line having the exclusive services of a staff of officials and possessing an entirely separate organization. "It is hardly, therefore, surprising that an atmosphere of bankruptcy and despondency has involved the undertakings generally." This statement is believed to apply to all the roads except the Taff Vale and one or two mineral lines. The *Times* thinks after the erection of a bridge over the Dee, connecting the roads with Liverpool, and through the permanent improvement in the trade of this part of the United Kingdom, indications of which are not wanting, the day may not be far distant when the companies it is proposed to associate together will be good dividend-paying properties.

The Finances of Brazil.

Herapath's gives the following data about the indebtedness of Brazil, which first came into the bourses of the world as a borrower in 1824, two years after asserting her independence, with a 5 per cent. loan for £3,686,200 contracted in England at 75. In 1825 another loan was contracted at 85, and in 1829 another at 52. This was at the time Dom Pedro I. abdicated in favor of the present Dom Pedro II. Brazilian credit improved from that until 1859, when a loan was offered at par; but in 1865, during the war with Paraguay, £6,963,600 5 per cents were offered at 74. In 1858 a 4½ per cent. bond had been floated at 95, and in 1860 another loan was offered at 90, and in 1863 another at 88. In 1883 a 4½ per cent. loan for £4,599,600 was placed at 89. This year bonds bearing 4½ per cent. interest to the amount of £6,297,300 have been disposed of at 97, which is the highest rate ever obtained by that country for 4½ per cents. Commencing borrowing in 1824, the external debt in 1854 was about £6,000,000. December, 1854, it was £7,947,100, but in January, 1885, it had more than doubled, and in December, 1887, it was £22,195,700. At the commencement of this year the combined external and internal debts of the Empire amounted to £72,471,700.

A Cantilever.

As far as it may concern the applicant for divorce, his bridge of sighs is a cantilever.—*Life*.

Profit-Sharing at the Paris Exposition.

The Exposition of Social Economy is divided into 15 sections, the second of which is devoted to Profit-Sharing and Productive Co-operation. The other sections embrace Wages, Apprenticeship, Union Aid Societies, Retiring and Life Pensions, Accident and Life Insurance, Savings, Co-operative Distribution, Workmen's Homes and Recreations, Banks, Hygiene, and Large and Small Industries. The United States Commission to the Exposition will contribute the complete works of the 22 State Bureaus of Labor Statistics in this country, making a collection of 75 volumes, and the presentation therewith of the literature, so far as America is concerned, relating to profit-sharing and co-operation. The manufacturers, by profit-sharing firms, will be found in their appropriate places in the main exposition. A full program of lectures and discussions on all the subject matters of the 15 sections will be held, and reports made from various countries.

The Obi Railroad.

The Russian newspapers give the following reports of this project: The Obi Railroad, the most northern railroad ever planned, will be of the greatest economic importance to Siberia. The projectors do not demand any subsidy or government guarantees. The river Malaya-Obi, near Obdorsk, is the starting-point of the projected line, which will take a direction towards the foot-hills of the Ural Mountains. The latter will be crossed in one of transversal valleys, which are not over one hundred feet above sea-level. It will cross the river Usa near its source, and reach the ocean through the tundra of Bolchesemelsk. Its terminus will be cut in the Bay of Shamoudir, near Belcoff Nosse. The total length of the line will be 260 miles. The cost of construction, including rolling stock, is estimated at ten million dollars. The establishment of a port on the Arctic Ocean, in the locality mentioned above, with all modern improvements for the loading and unloading of vessels, is estimated at one and a half million dollars. To this must be added the cost of establishing a line of river-boats on the Obi and Irtysh, which is estimated at two and a half million dollars. Thus the whole plan requires the expenditure of fifteen million dollars in works of construction. It is believed that the line can be worked for six months of the year. The products of the remotest parts of the Obi basin will be carried to the shipping port on the ocean in twelve days, while twelve days more will be sufficient to carry them to London. The railroad is intended as a means for making the transactions of a Siberian commercial company, which has been founded recently, profitable. According to the concession granted by the Russian government, this road will not be open to the public, but will only be used by the grantee, who proposes to export the grain and stock from southern Siberia, and hopes to be able to furnish the London market with

north Siberian fish. On the other hand, the company will import principally machinery, which so far has hardly found its way to Siberia, and other articles which are at present imported by Moscow merchants.—*Science*.

The Hudson's Bay Company.

There is trouble in the Hudson's Bay Company. It is claimed that in six years the shares have fallen from £40 to £19 (the capital stock is 100,000 £13 shares) and that the dividends are sadly declining, having fallen in 15 years from 11s. 7d. to 10s. 10d. per share. Under these circumstances Mr. McLean seeks proxies for a seat in the Board, saying the above symptoms of decline are the more serious because the immense increase of facilities for the company's operations in Canada, through the introduction of railroads, telegraphs and immigration, should have been followed by prosperity instead of decline. This statement is fortified by a citation of the fact that the sales of the land department amounted to £13,000 last year and the expenses of the department for the same period were £17,000; this would seem to the unprejudiced observer to be a state of affairs which might be improved, and *Herapath's*, without "any intimate acquaintance with Mr. McLean's special qualifications," supports him as "the embodiment of a protest."

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Iowa, a railroad company incorporated in 1883 did not commence to build its road until 1886, but money was expended and continuous and persistent efforts were made, during that time, to procure additional means to construct the road. The Supreme Court holds that the corporation did not lose its franchise by non-user, under Code Iowa, § 1,079, which provides that a corporation shall cease to exist by the non-user of its franchise for two years at any one time, though the subscriptions of the capital stock had not been paid.¹

In Minnesota the Supreme Court holds that the statute of 1887 creating the railroad and warehouse commission and defining its duties, does not authorize an appeal to the district court from an order of the commission prescribing rates to be charged by common carriers.²

In the same state the defendant H., being the owner of a railroad, organized a company to whose stock he was the only actual subscriber, and sold his road to the company at a price about 15 times its value, taking in payment the stock and bonds of the company. To pay a debt he owed complainants, H. sold them a portion of the bonds, amounting to about three times the value of the road, upon which bonds judgment was rendered against the company. Complainants had refused to receive the road itself, or the capital stock, in payment of their debt, and the sole object of the organization of the company was to make use of the road in the payment of the debt; but whether complainants knew that fact was doubtful. The United States Circuit Court holds that the stockholders are liable, respectively, for the payment of such judgment, to the amount of their subscriptions, in spite of a provision in said bonds that no stockholder should be individually liable therefor.³

Carriage of Goods and Injuries to Property.

In Kentucky the Court of Appeals decides that under a contract by a sub-contractor with a railroad contractor, which provided that, in the event of cancellation, the sub-contractor should be paid for "labor done and materials furnished up to the date of the cancellation," the sub-contractor may recover the contract price for materials procured or prepared to be furnished, although not delivered and received at that time, the materials being so cut and prepared as to be useful for the purpose only for which they were intended, and therefore not marketable.⁴

In Texas the Supreme Court holds that in action for damages against a receiver of a railroad company the judgment should be against the receiver in his official character, and not prescribe any particular fund of the railroad on which it should constitute a lien, as all the property of the railroad company is in the hands of the court appointing the receiver, and the latter court should determine matters pertaining to the enforcement of the judgment.⁵

In Iowa the plaintiff opened the fence along defendant's railroad at a point where the wires composing it ended, drove his cattle through the opening, and, as he claimed, again fastened the wires to the post as they were before. The cattle returned upon the track through the place where the opening had been made, and were injured by defendant's train; but the wires were found not broken, but unwrapped from the post. It appeared that the cattle had never broken through the fence at that point before, and that the wires had recently been securely fastened by defendant's section men. The Supreme Court holds that defendant was not negligent with reference to the condition of the fence, nor liable for injury to the cattle, in the absence of negligence in running its train.⁶

In the same case the plaintiff's colts were injured by defendant's train while he was driving them along the right of way inside the fences to a crossing, intending there to turn them off. The Supreme Court rules that plaintiff was guilty of negligence, and could not recover in the absence of negligence on defendant's part.⁷

In Wisconsin the Supreme Court holds that grounds on the main line of a railroad, whereon are situated a water-tank for replenishing engines, a building within which is a telegraph office, a ticket office, and a place for eating and sleeping, which building is occupied by the company's station men and telegraph agent, who also sells tickets to passengers, and a platform at which trains are accustomed to stop for the purpose of receiving and discharging passengers and freight, constitute "depot grounds," within the meaning of the Wisconsin statute, which excepts depot grounds from the requirement that railroads be fenced.⁸

Injuries to Passengers, Employees and Strangers.

In Maine, the Supreme Judicial Court rules that a yard brakeman cannot recover of a railroad company for an injury received in falling from a flat car, loaded with coal, while attempting to stop the car from running down a side track and possibly off the end of it, by jumping upon the brake-beam under the forward end of the car and pressing it down with his feet, holding himself to the car with one hand and pulling up the brake-chain with the other, the excuse for the act being that the brake-staff was so bent that it could not be operated—there being no rule of the company, or direction from any of its officers, requiring such a service of the brakeman.⁹

In Kentucky a brakeman on defendant's train, in going between two cars to make a coupling, was compelled to stoop in order to avoid the projecting lumber piled on one of the cars, and stumbled, fell, and was killed. The conductor knew, or could have known, that the car was so improperly loaded as to imperil the life of one going between it and another car to make a coupling, but he was not shown to have ordered the brakeman to go between the cars. The Court of Appeals decides that, as the brakeman could observe the danger for himself, and, in the absence of orders, right-

fully refuse to go between the cars, the jury were properly instructed to find for defendant.¹⁰

In Texas the plaintiff was employed by a railroad company in taking cinders and ashes from a pit under a boiler and furnace. The pit was covered with two loose plates of iron, each weighing from two to three hundred pounds. He placed one of the plates on its edge, and propped it on the outside with a stick, which was supported only by the smooth surface of the iron, and while at work in the pit the plate fell, injuring him. He had worked there six weeks, and knew of the condition of the plate covers, and had full opportunity to know of any defects which would render the plate thus secured dangerous. The Supreme Court holds that he could not recover for the injury.¹¹

In Iowa a railroad company employed a contractor to build its road, and agreed to furnish the motive power and operate the construction trains. The contractor was to handle all material, and build a certain number of miles per month. The Supreme Court holds that the company's engineer on a construction train was not under the control of the company, but under that of the contractor, and that the company was not liable for injuries caused by negligence of the engineer, in too rapidly operating the train.¹²

In Iowa a brakeman, injured on a railroad, was at the time of the accident aged 19 and strong and healthy. The injury caused him long and excruciating pain, and he was compelled to lose a portion of his ankle bone, and the joints of his ankle and foot were stiffened, rendering him a cripple for life, and unfit for manual labor, which was the only occupation for which he was qualified. The Supreme Court holds that a verdict for \$8,000 damages was not excessive.¹³

In Texas a baggageman while moving a heavy truck, upon which were a lot of trunks, was injured by a trunk falling off, caused by a defect in the truck. The evidence showed that the injury would not have been sustained but for the defect, and plaintiff testified that he was handling the truck in the usual way; that he did not know of the defect, and could only have known of it by inspection underneath the truck; and there was evidence of want of care on defendant's part, and of proper care on the part of plaintiff. The Supreme Court affirms a verdict against the railroad.¹⁴

In Vermont, it is held by the Supreme Court that an officer having a writ by which he is commanded to arrest the body of the defendant, a railroad engineer, may lawfully stop a train of cars run by such engineer for the purpose of making the arrest.¹⁵

In Iowa the plaintiff, a brakeman, descended from defendant's moving train, and ran to a standing car, to couple it to the train in obedience to the order of the conductor, who indicated that he would go upon the train, apply the brakes and reduce its speed, as was his custom in such cases. Plaintiff, when he was injured in making the coupling, supposed that the conductor had performed his duty and slackened the speed of the train, though he might have seen by glancing back on descending from the train that the conductor had not gone upon it, and might have seen that the speed was not lessened had he noticed the approaching cars. The rate of speed of the moving train at the time of the injury was 4½ miles per hour. Plaintiff and another witness testified that the rate of speed at which such couplings were ordinarily made was 2 miles per hour. Defendant's testimony, which consisted of the testimony of men of long experience, tended to show that such couplings could safely be made when the cars were running at a much higher rate of speed than at the time of the injury. The manner in which couplings were made and the weight of the cars were explained to the jury. The Supreme Court holds that the train was run at a negligent rate of speed, and affirms a verdict against the company.¹⁶

In Ohio the Federal Court decides that a by-law of a railroad relief association requiring its members to release the railroad company from any claim for damages before applying to the association for relief is not against public policy, as it simply puts a claimant to his election whether he will look to the railroad company or the relief association for compensation. But a person is not estopped from claiming compensation from the railroad company for an injury resulting from a collision by having been previously compensated by the relief association for the injury which he then untruthfully alleged was caused by malaria.¹⁷

In Iowa the plaintiff stopped her horse and buggy about half a block from a railroad crossing to await an opportunity to cross, and was signaled by the flag-man stationed at the crossing to drive over. When the horse had nearly reached the track the flag-man called to plaintiff to stop on account of an approaching train, which she did, but the horse became frightened and overturned the buggy, injuring the occupants. Plaintiff heard the ringing of the bell on an approaching train, and the other occupant of the buggy saw the train as they drove up to the track, but there was evidence that, if the flag-man had abided by his original signal, they would have passed over in safety. The Supreme Court reverses a verdict in favor of the railroad company.¹⁸

- 1 Young v. W. C. & S. W. R. Co., 39 N. W. Rep., 234.
- 2 Minn. & St. L. R. Co. v. R. R. Commrs., 39 N. W. Rep., 151.
- 3 Preston v. C. C. H. & V. R. Co., 36 Fed. Rep., 54.
- 4 Clin. & S. E. R. Co. v. Gray, 9 S. W. Rep., 281.
- 5 Brown v. Tex. & Pac. R. Co., 9 S. W. Rep., 261.
- 6 Davidson v. Cent. Iowa R. Co., 39 N. W. Rep., 163.
- 7 Davidson v. Cent. Iowa R. Co., Id.
- 8 Peters v. Wis. Cent. R. Co., 39 N. W. Rep., 380.
- 9 Judkins v. Maine Central R. Co., 6 N. Eng. Rep., 715.
- 10 Brice v. L. & N. R. Co., 9 S. W. Rep., 288.
- 11 Brown v. Tex. & Pac. R. Co., 9 S. W. Rep., 261.
- 12 Miller v. M. & N. W. R. Co., 39 N. W. Rep., 188.
- 13 Henry v. S. C. & P. R. Co., 39 N. W. Rep., 193.
- 14 Mo. Pac. R. Co. v. Crenshaw, 9 S. W. Rep., 363.
- 15 St. Johnsbury & C. R. Co. v. Hunt, 7 N. Eng. Rep., 41.
- 16 Henry v. S. C. & P. R. Co., 39 N. W. Rep., 193.
- 17 Owens v. B. & O. R. Co., 35 Fed. Rep., 715.
- 18 Buchanan v. C. M. & St. P. R. Co., 39 N. W. Rep., 663.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Boston, Revere Beach & Lynn, 3¼ per cent., payable Jan. 1.
- Missouri Pacific, quarterly, 1 per cent., payable Jan. 15.
- Morris & Essex, 3¼ per cent., payable Jan. 2.
- Nashville, Chattanooga & St. Louis, 1½ per cent., payable Jan. 10.
- New Castle & Beaver Valley, quarterly, 2½ per cent., payable Jan. 1.
- Northern Central, 5 per cent., payable Jan. 15.
- Oregon Railway & Navigation Co., quarterly dividend, 1½ per cent., payable Jan. 8.
- Richmond & West Point Terminal Co., 2½ per cent. on preferred stock, payable Jan. 10.
- Richmond, Fredericksburg & Potomac, 3¼ per cent., payable Jan. 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Cleveland & Pittsburgh, annual meeting in the office of the company in Cleveland, O., Jan. 2, 1889.

East Tennessee, Virginia & Georgia, special meeting, Knoxville, Tenn., Dec. 22, to consider the approval of the lease to the Richmond & Danville.

Knoxville & Ohio, annual meeting, Knoxville, Tenn., Jan. 21, to consider the question of approving the lease of the Knoxville & Ohio to the East Tennessee, Virginia & Georgia, heretofore made in accordance with resolutions adopted by the board of directors.

Lehigh Valley, annual meeting, Philadelphia, Jan. 15.

Loyalsock, annual meeting, Philadelphia, Jan. 14.

Montpelier & White River, annual meeting, Barre, Vt., Jan. 10.

Norwood & Montreal, annual meeting, 96 Broadway, New York, Dec. 28.

Pennsylvania & New York Canal & Railroad Co., annual meeting, Philadelphia, Jan. 14.

Philadelphia & Reading, annual meeting, Philadelphia, Pa., Jan. 14.

Pittsburgh & Lake Erie, annual meeting, Pittsburgh, Pa., Jan. 22.

Rome, Watertown & Ogdensburg, annual meeting, 96 Broadway, New York, Dec. 28.

Rome, Watertown & Ogdensburg Terminal, annual meeting, 96 Broadway, New York, Dec. 28.

Syracuse, Phoenix & Oswego, annual meeting, 96 Broadway, New York, Dec. 28.

Western New York & Pennsylvania, annual meeting Philadelphia, Jan. 14.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Association of American Railway Accounting Officers meets at the Southern Hotel, St. Louis, Mo., Jan. 24, 1889.

The American Association of Railway Chemists will hold its next meeting in Baltimore, Md., Jan. 14, 15 and 16.

The New England Railroad Club meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The Western Railway Club holds regular meetings on the third Tuesday in each month at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street New York.

The Boston Society of Civil Engineers holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The Engineers' Club of St. Louis holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m. at its rooms in the Penn Building, Pittsburgh, Pa.

The Engineers' Club of Kansas City meets at Kansas City, Mo., on the first Monday in each month.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m. on the third Saturday in each month.

American Society of Civil Engineers.

A regular meeting was held Dec. 19 at 20 o'clock. The Secretary called attention to some photographs sent by Mr. H. Stanley Goodwin, showing the results of tests of specimens of timber treated by various processes and immersed in the sea. The specimens tested had not been in the water long enough, nor were they numerous enough to furnish conclusive evidence as to the relative merits of different processes in preventing the ravages of the ship worm. Mr. Collingwood told of some observations that he had lately had opportunity to make of timber treated by wood creosote and of untreated timber subjected to the same conditions. The pieces were several 3 x 4 in. scantling from structures standing in sea water. At the first examination the untreated timber was found badly eaten by the teredo, while that treated with wood creosote was apparently sound. Further examination of the treated timber at low tide showed that it had been attacked close to the mud line. The experience of others confirmed this. Mr. Collingwood also mentioned some recent experience with timber that had evidently been overheated in treatment. It was fine oak timber, but was badly warped and checked, and to have lost its cohesion so much as to offer little hold for spikes.

Mr. Flagg brought up the question whether or not timber with the bark on is safe against the teredo. Several members said positively that it is, but ordinarily impracticable to keep the bark intact.

Secretary Bogart showed and explained working drawings of a number of lift bridges in use at several places on the Erie Canal. The bridge floor is hung about 10 ft. below the supporting trusses by steel rods, and accurately counterweighted. By a simple gearing the bridge floor may be lifted up to the bottom of the trusses, giving a clear headway of 12 ft. above the water line. In the bridge worked by hand the equilibrium between the lifting bridge and its counterweights is overcome by two weights, one acting to raise the bridge and the other to lower it. These weights are wound up by the bridge tender, and one or the other is thrown into gear as required. In another type of bridge the operating power is supplied by a turbine, and in still another by a hydraulic cylinder connected with city mains. A 90 ft. span complete costs about \$9,000.

The Board of Direction informs the members of the Society that the following communication has just been received from the Institution of Civil Engineers.

To the Secretary of the American Society of Civil Engineers:

SIR: It is reported that many engineers from the United States will probably visit Europe during the International Exhibition which is to be held in Paris in 1889.

In view of this, the Council of the Institution of Civil Engineers, at the first meeting of the present session, directed an inquiry to be addressed to you to ask: 1st. Whether this report is correct, and, if so, whether your society can give any idea of the number of your members likely to come. 2d. Whether they will travel by way of England, and 3d. What

may be expected to be the approximate date of their arrival and the duration of their stay in this country.

The object of this inquiry is to enable the Council to consider the possibility of making such arrangements as may best tend to further the objects which the visitors have in view, and to render their visit generally as useful and agreeable as possible.

The Council need hardly assure you of its good will towards its professional brethren in the United States, and of its desire to embrace this opportunity of manifesting its friendly feeling to the utmost of its power.

Of course, in any case, the facilities afforded by this institution are always at the disposal of your members.

We are, yours faithfully,

GEORGE B. BRUCE, President.

WILLIAM POLE, Hon. Secretary.

JAMES FORREST, Secretary.

This circular is now issued so that a proper reply may be made to the above letter.

For the information of members the following additional facts are given: An invitation has been extended to the American Society of Mechanical Engineers, by the Institution of Mechanical Engineers of London. We are informed that it is expected that other foreign Engineering or Scientific Societies will also arrange for special courtesies, and that in all these the members of this Society will be included. The American Institute of Mining Engineers and the American Society of Mechanical Engineers are taking steps to ascertain the probable number of their members who would visit Europe next spring in case special arrangements are made.

The following information has been secured by a committee of the American Society of Mechanical Engineers as to practicable arrangements, and these or substantially similar arrangements can be made for the members of the American Society of Civil Engineers and their families:

Dates—Minimum absence, five weeks. From, say last week in May to first week in July.

Cost—Round trip passage by steamer about \$110, going altogether in a body and returning individually at any time during the year, as may be convenient. Cost per day in Europe from \$4 upward.

Engineers' Club of Philadelphia.

At the meeting of Dec. 1, 1888, the following were elected: Active Members, Sanford K. Campbell, Clifford Stanley Sims, Jr., John H. Webster, Jr., Walter Brinton, Albert S. Coffin, Charles Silliman and Frederick B. Miles; Associate Member, Prof. C. Herschel Koyl.

The Secretary presented, for Mr. Heber S. Thompson, a paper on Earth Embankments for Reservoirs. The bursting of the Mena Reservoir at Valparaiso, on the 11th of August, and the loss of life and destruction of property attending it, enforces again the lesson, so often taught before, of the necessity of the extreme care in the building of earth embankments to retain large bodies of water. By this disaster more than fifty lives were lost, and property was damaged to the value of nearly three million dollars. There are special difficulties attending the building of earth embankments in the anthracite coal regions of Pennsylvania, due to crevices in the rocks under the reservoir and puddle wall. These crevices, to which the tilted, and more or less steeply inclined, measures are specially liable, are more common in the vicinity of the ravines usually desired for reservoir purposes.

Mr. Howard Murphy discussed this subject, presenting an informal account of a recent accident to a part of one of the basins of the reservoir at Rcanake, Va., when, after the explosion of a magazine containing three tons of dynamite and 400 kegs of powder, within 2,500 ft. of the reservoir, a portion of the embankment of the south basin dropped into a limestone cavern or crevice, which was already known to exist under that portion. The rock formation near that point is of vertical crags and large boulders, firmly embedded in a red clay gravel, almost as solid as hard pan, and a trial shaft just alongside of the break had shown the formation to be thoroughly solid for a depth of 33 ft. below the bottom of the basin. It is not remarkable, however, that the explosion should have occasioned this break by a drop of material into the cavern from a much greater depth than this. The surface of the ground dropped in when the Croton Aqueduct Tunnel collapsed at a depth of 150 ft. below it. The reservoir was located along the mountain side so as to bring its whole bottom in excavation.

There is much to excite curiosity in the formation near the Roanoke Reservoir, as there is no doubt that a tributary of one of the most remarkable springs in the world passes under a portion of the basin, and the writer hopes in the future to present a paper upon the subject, although the experience in this case can be of little value in any other, owing to the uncertainty as to the behavior of limestone formations under the peculiar weight of water wherein there is none of the arch action of even very loose earth.

Mr. L. F. Rondinella exhibited and described the scale of proportional inches which he has prepared. This scale is designed especially for the use of mechanical engineers and machine draftsmen. The civil engineer has his scale of feet or inches divided decimally; the architect his scale of proportional feet, where the unit ($\frac{1}{4}$ in., 1 in., $1\frac{1}{2}$ in., etc.) represents one foot and is divided into twelve parts for inches. But the mechanical engineer, though working almost exclusively in inches in his designs, has been obliged heretofore to use the architect's scale, transforming each size from inches to feet and inches before laying it down on his drawing, with considerable loss of time and liability to error; while the scale that is perhaps most used by machine draftsmen—half-size—is entirely absent from the architect's scale as usually made. The scale of proportional inches contains the scales that are most used in practice—full size, half-size, quarter-size and eighth-size—in inches. The divisions are arranged as in the architect's scale, two scales on each edge, the unit outside of the zero point being subdivided in the larger sizes to sixteenths, in the smaller sizes to eighths. The graduations are U. S. standard, engine divided, and the scale is furnished in Bristol board or boxwood.

Northwest Railroad Club.

A meeting of mechanical officers of the road's centering in St. Paul and Minneapolis was held on the evening of Dec. 1 for the organization of the Northwest Railroad Club. A temporary organization was effected by the election of Mr. W. T. Small, of the Northern Pacific, as temporary chairman, and Mr. H. P. Robinson, editor of the *Northwestern Railroad*, as temporary secretary. The meeting adjourned to meet Dec. 15, and receive reports of committees on constitution and effect a permanent organization. All of the railroads centering in St. Paul and Minneapolis were represented at this meeting.

PERSONAL.

—Mr. J. T. Ripley succeeds E. D. Moore as Chairman of the Western Classification Committee, office at Chicago.

—Inter-state Commerce Commissioner Bragg, whose term expires on Jan. 1 next, has been renominated by the President.

—M. J. Rogers, Master Mechanic of the Chicago, Santa Fe & California at Streator, Ill., will this week remove his office to Chicago.

—F. B. Papy has been appointed Assistant Traffic Manager of the Savannah, Florida & Western and the lines composing the Plant system.

—The title of F. H. Kingsbury, formerly Through Freight Agent of the Pennsylvania, is to be Eastern Superintendent of the Union line, with office in New York.

—Josiah Johnson, who was formerly Superintendent of the Western Division of the Southern Pacific and also of the Placerville Division of the same road, died recently at Sacramento.

—Engineer Cook, who was the runner of the foremost engine in the Mud Run collision, Oct. 10, is said to be losing his mind through grief, fear of punishment and inability to get employment.

—Mr. Frederick W. Hall, who was recently appointed Superintendent of Construction on the Port Townsend Southern road, has resigned that position to accept one on a local road at Port Townsend.

—Mr. H. G. Young, Assistant to the President and General Manager of the Delaware & Hudson Canal Co., has been elected Second Vice-President, and will hold that office from Jan. 1. The office of Assistant to the President is abolished. Mr. Young will continue to act as General Manager.

—John McLeod, who was recently appointed General Manager of the Louisville Southern, has resigned, as a result of the lease of the road to the Louisville, New Albany & Chicago. He will still retain the title of Chief Engineer, however, and will have charge of all the extensions of the road.

—Mr. Charles F. Mayer, Jr., of Baltimore, a cousin of Charles F. Mayer, President of the Baltimore & Ohio, died suddenly Dec. 17, of apoplexy. He was in the United States Engineering Corps during the late war, was with Admiral Farragut in the encounter at New Orleans, and was on board the "Housatonic" when she was blown up in Charleston harbor.

—Mr. J. B. Kirkland, at present Pacific Coast agent of the Pennsylvania, has been appointed Passenger Agent on the Pacific Coast of the Union Pacific, and S. E. Eccles, now Agent of the Mexican International, has been appointed Freight Agent of the same road. These changes are to take place Feb. 1. D. W. Hitchcock, the present General Agent on the Pacific Coast will be transferred.

—Mr. Waterman Stone, of Providence, R. I., the well-known Secretary of the North American Superintendents' Association, has resigned his position on the Old Colony to become General Manager of the Inter-state Consolidated Rapid Transit Railway, of Kansas City. Mr. Stone, although a young man, has been in the service of the Providence, Warren & Bristol for 24 years, and has worked in all departments. For 17 years he has been Superintendent and Chief Engineer.

—Mr. Nathaniel J. Bradlee, one of the most prominent capitalists of Boston, died suddenly in the cars while on his way to Keene, N. H., on Dec. 18. Mr. Bradlee was best known as a trustee, having had charge of more than a hundred estates and other trusts, and being president of a number of trust, insurance, safe deposit and other institutions. He was a director in the Boston & Maine and Eastern Railroads and President of the Massachusetts Charitable Mechanics' Association. He was 60 years of age, and left about \$1,000,000.

—Mr. W. R. Davenport, President of the Erie Car Works, died suddenly in Buffalo, N. Y., Dec. 13, at the age of 57 years. Mr. Davenport was the first agent at Erie, Pa., of the Cleveland & Erie Railroad, now the Lake Shore & Michigan Southern. With two others he founded the Erie Car Wheel Works, of which he was President. In 1874 he organized the American Fuse Co. and was its President. In 1881 he erected at St. Ignace, Mich., the Martell Charcoal Furnaces. He devoted much of his time and energies to forming and maintaining many benevolent and educational institutions, and was for two years President of the Young Men's Christian Association of Pennsylvania, and for ten years of that at Erie.

—Charles F. Mayer, the new president of the Baltimore & Ohio, is described as a man of action rather than words. As president of the Despard Coal companies, his energy and enterprise built up a large gas coal trade. He is known as a patient and intelligent compiler of statistics, and was selected to collect and digest the facts connected with the soft coal trade of the country for submission to Congress. Mr. Mayer is also president of the Cumberland & Pennsylvania Railroad, the Susquehanna & Tidewater Canal Co., and a number of other corporations. Mr. Mayer was married in 1863 to a daughter of George M. Keim, of Reading, Pa., and sister of George De B. Keim, President of the Reading Coal & Iron Co.

—David A. Stewart, Chairman of the firm of Carnegie Brothers & Co., died in Pittsburgh, Pa., on Saturday last, at the age of 57. Mr. Stewart was President of the Pittsburgh Locomotive and Car Works, one of the managing directors of Carnegie, Phipps & Co., and President of the Carnegie Natural Gas Co. He was born at Loudon, Pa., and was a son of the first ticket agent of the Pennsylvania at Pittsburgh. During the early oil excitement Mr. Stewart joined his uncle, Col. Thomas A. Scott, and Andrew Carnegie in the "Columbia Company" and made their fortunes. Mr. Stewart was afterwards president of the company. His wife was a daughter of John Scott, President of the Merchants' and Manufacturers' National Bank of Pittsburgh. Mr. Stewart was for many years a director of the Allegheny Valley and the Pittsburgh, Virginia & Charleston railroads. With Mr. Carnegie and others he formed the Edgar Thomson Company in 1872, and they built the great steel works at Braddock.

—Gen. James C. Lane died at his office in New York City at midnight Dec. 12. He was born in New York in 1823. After being graduated in 1841, he made a specialty of architecture and of civil engineering, which he carried on until 1851. He aided in the construction of the Illinois Central Railroad. Later he entered the United States Coast Survey at Washington and was afterward engaged in mineralogical surveys in San Domingo, Porto Rico, and Cuba. He entered the civil war as Major of a New York regiment and served in 16 battles including Lookout Mountain and Missionary Ridge and the Georgia campaign. Since the close of the war Gen. Lane has been engaged in mineralogical surveys in California, Arizona, Nevada, and Lower California, as well as topographical surveys in Palestine. He was also engaged as Chief Engineer of the South Side and of the New York, Woodhaven & Rockaway roads of Long Island, and at the time of his death had just completed his duties as Chief Engineer of the new parks of Westchester County.

—Mr. J. T. Harahan, the official announcement of whose appointment to succeed the late Edward Gallup as Assistant General Manager of the Lake Shore is given in another column.

has been in railroad service since 1864, and has seen service in all ranks. He began on the Orange & Alexandria, working at a station, in shops and as engineer. He went from there to the Nashville & Decatur, now a part of the Louisville & Nashville, and was conductor, yard master and road master. In 1878 he was made Superintendent of the Memphis line. In 1880 he was transferred to the New Orleans & Mobile division, and a year later his duties were increased by the addition of another division to his jurisdiction; in 1882 he became General Superintendent of lines south of Decatur, Ala., and July 1, 1884, the title of general manager of the whole line was conferred upon him. For three months following Jan. 1, 1885, he filled the position of General Manager of the Baltimore & Ohio, resigning that office to re-enter the service of the Louisville & Nashville as Assistant General Manager. In October of the same year he was again appointed General Manager, which position he has filled to the present time. Mr. Harahan is well known to all interested in the General Time Convention by his important and useful service on the committee that framed the Uniform Code of Train Rules.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—Charles F. Mayer has been elected President of the road, vice Samuel Spencer.

Buffalo & Southwestern.—The following directors of the road have been elected: W. S. Bissell, James Adams, E. G. Spaulding, H. G. Nulton, J. M. Richmond, O. P. Ramsdell, W. H. H. Newman, Daniel E. Bailey, Andrew Langdon, Daniel O'Day, Thomas Hodgson, Richmond Kirgman and John Scott.

Cincinnati, Jackson & Mackinaw.—F. W. Deibert has been appointed Master Mechanic in charge of Locomotive and Car Departments, with headquarters at Toledo, O.

Connecticut River.—At the annual meeting in Springfield, Mass., the old board of directors was re-elected as follows: Oscar Edwards, of Northampton, Mass.; Charles S. Sargent, of Brookline, Mass.; William R. Cone, of Hartford, Conn.; Frederick Billings, of Woodstock, Vt.; Augustus T. Perkins, of Barnstable; William Whiting, of Holyoke, Mass.; and Frederick H. Harris, N. A. Leonard and A. B. Harris, of Springfield.

Elgin, Joliet & Eastern.—The directors of the consolidated company are: J. W. Howell, Russell Whitman, G. M. Trowbridge, C. S. Holt, A. J. Caton, Norman Williams, A. F. Towne, A. D. Wheeler, F. D. Raymond, C. E. Towne and R. F. Clinch.

Eureka Railroad & Coal Co.—The directors of this new California company are: Julius Koebig, R. D. McElroy, A. R. Green, D. Gutzmann and Nathan Bibb, of San Francisco, and Bartholomew Noyes and F. R. Noyes, of Oakland.

Florida Railway & Navigation Co.—N. S. Pennington, General Freight Agent, has been appointed Traffic Manager, and will have supervision of both freight and passenger business. His headquarters will be at Jacksonville.

Fort Worth & Denver City.—The annual meeting was held in Fort Worth, Tex., last week. Of the 89,850 shares of stock, 83,683 shares were represented. The stockholders elected the following board of directors: T. W. Pearsall, J. T. Granger and A. J. Mayer, of New York; W. T. Walters, of Baltimore; Morgan Jones, J. P. Smith, William M. Harrison, W. F. Somerville and J. M. Brown, of Fort Worth. The directors elected Morgan Jones President, T. W. Pearsall Vice-President, J. T. Granger Treasurer and W. A. Ross Secretary.

The following appointments have been made: F. Wild, Jr., Assistant General Freight Agent, with headquarters at Denver, Col.; W. C. Harvey, General Agent, with office at Colorado Springs, Col.; John S. Inglis, Commercial Agent at Portland, Or., has been transferred to San Francisco, with the title of General Agent. W. J. McDonald, Assistant General Agent, with office in Portland, Or. He will also have charge of the territory heretofore assigned to R. F. Harriott, Traveling Freight and Passenger Agent at Butte, M. T., the latter having resigned.

Genesee Valley Terminal.—At the annual meeting of the company in Rochester, N. Y., this week, the old board of directors was re-elected. The road is leased to the Western New York & Pennsylvania.

Hartford & Connecticut Western.—At the annual meeting of the stockholders of the road in Hartford, Conn., this week, the following directors were elected: John S. Wilson, John W. Brock, W. W. Gibbs, Charles-magne Tower, Jr., Arthur E. Newbold and William B. Scott, all of Philadelphia, Pa.; Arthur Brock, of Lebanon, Pa.; William H. Barnum, of Lime Rock, Conn.; and Frederick Miles, of Salisbury; Henry Gay, of West Winstead; Jeffrey O. Phelps, of Simsbury; J. H. Appleton, of Springfield, Mass.; and H. A. Botsford, of Hartford. The members of the old board who retire are Charles T. Hillyer, of Hartford; William L. Gilbert, of Winsted; Milo B. Richardson, of Salisbury; and J. W. Husted, of Peekskill, N. Y. The new board of directors elected John S. Wilson, of Philadelphia, President, vice J. W. Husted, and Edward R. Beardsley, of Hartford, Secretary and Treasurer. No appointment of a Superintendent to succeed Mr. Edwin McNeil, who recently resigned that position, was made.

Housatonic.—At the annual meeting in Bridgeport, Conn., this week, the following directors were elected: W. H. Starbuck, John L. Macaulay, Thomas Rutter, Henry Hentz, New York; William H. Stevenson, Bridgeport; William H. Barnum, Lime Rock; A. B. Mygatt, New Milford; S. E. Merwin, New Haven; W. E. Downs, Birmingham. At a subsequent meeting of the directors, the following officers were elected: President, W. H. Starbuck; Vice-President and General Manager, William H. Stevenson; Secretary, A. J. Porter; Assistant Treasurer, C. E. Robinson.

Indianapolis Belt.—F. C. Doran has been appointed Engineer of Maintenance of Way.

Kentucky Midland.—The officers of the Home Construction Company are: President, Gov. J. E. Cantrill; Secretary, W. F. Dandridge; Treasurer, E. L. Samuel, all of Frankfort, Ky. The directors are: H. P. Mason, S. B. Mason, C. E. Hoge, S. B. Dandridge, J. E. Cantrill, R. W. McRery, R. K. McClure, and Fayette Hewitt. The general offices are at Frankfort, Ky.

Lake Shore & Michigan Southern.—J. T. Harahan has been appointed Assistant General Manager of this company's lines, with office at Cleveland, O., to succeed E. Gallup, deceased. He will assume the duties of the position Jan. 1, and will have charge of the transportation and passenger departments, and of such other business of the company as may be assigned to him by the general manager.

Lincoln Park & Charlotte.—The officers are: President, Adrian Iselin, 36 Wall street, New York; Secretary, John H. Hocart, New York; Chief Engineer, W. E. Hoyt, Rochester, N. Y.

Maine Central.—The annual meeting of the company was held in Portland, Me., Dec. 19. The following officers were

elected: President, Arthur Sewall; Vice-President and General Manager, Payson Tucker; Secretary, J. H. Drummond; Directors, Arthur Sewall, H. N. José, George C. Lord, Richard Olney, Amos Paul, Darius Alden, W. G. Davis, J. S. Ricker, Frank Jones, Thomas W. Hyde, S. C. Lawrence, Francis W. Hill, John Ware. Richard Olney takes the place of Nathaniel J. Bradlee, deceased.

Manhattan Beach.—The stockholders of the company elected the following directors: William G. Wheeler, J. R. Maxwell, Charles L. Flint, William J. Kelly, Edward E. Sprague, J. R. O. Sherwood, Henry Graves, H. W. Maxwell, Frank McDonough, Edwin H. Atkins, Gilman S. Moulton and Thomas F. Ward.

Monterey & Mexican Gulf.—The officers of this Mexican company are: General Trevino, of Monterey, President; T. S. Bullock, of New York, First Vice-President; Frank R. Brown, of San Antonio, Tex., Second Vice-President; J. J. Fisher, of St. Louis; Third Vice-President, and V. A. Wilder, of New York, Secretary and Treasurer.

Mt. Holly, Lumberton & Medford.—At the annual meeting in Mt. Holly, N. J., last week, the stockholders elected the following board of directors: Henry I. Budd, Henry C. Risdon, Clifford Stanley Sims, Franklin B. Leirs, Edward Willis, Daniel Sutter and Isaac W. Stokes. At a subsequent meeting the board organized by electing Henry I. Budd President, Clifford Stanley Sims Vice-President, and Isaac W. Stokes Secretary and Treasurer.

New York, Providence & Boston.—Directors were chosen as follows at the annual meeting in Providence last week: S. D. Babcock, G. M. Miller, N. F. Dixon, Robert Knight, H. C. Robinson, O. P. Wetmore, J. L. Riker, B. N. Lapham, J. W. Wood, J. P. Morgan, G. G. Haven.

Orange County.—The directors of this connecting New York road are: J. R. Maxwell, Joseph S. Harris, Edward D. Adams, J. W. Watson, George S. Jones, S. Dickson, George F. Baker, Francis C. Yarnall, T. C. Henry, S. Shepherd, R. W. De Forest, Loyal Farragut and Henry Maxwell.

Pennsylvania Railroad.—The following circulars have been issued: At a meeting of the board of directors, held Nov. 23, the offices of local freight agent and through freight agent were abolished; the office of assistant general freight agent was created and Mr. John Whittaker appointed Assistant General Freight Agent, to date from Nov. 23.

Under the revised organization of the freight department of the Pennsylvania and its controlled lines east of Pittsburgh and Erie, recently adopted, the following appointments were made: William H. Joyce, General Freight Agent; John Whittaker, Assistant General Freight Agent, F. D. Howell, Freight Claim Agent, with offices at Philadelphia.

The following extracts from the revised organization are published:

"The general freight agent is under the direction of the first vice-president. He is aided by an assistant general freight agent and a coal freight agent. The first named acts for the general freight agent in his absence, and the other has special charge of the coal and coke business. He also, under the authority of the general freight agent, names the rates of transportation therefor, and performs such other duties as may be assigned by the general freight agent.

"The general freight agent is assisted by two division freight agents of the Pennsylvania Railroad Division, one for the United Railroads of New Jersey, one for the Philadelphia & Erie, two for the Northern Central, one for the Philadelphia, Wilmington & Baltimore, one for the West Jersey and Camden & Atlantic roads, and a freight claim agent.

"The division freight agents are specially charged with the duty of procuring freights for, and making local freight rates on, their respective divisions.

"The Eastern Superintendent of Union Line performs such duties in connection with the freight business of the Pennsylvania Railroad as may be specially assigned to him by the General Freight Agent of the Pennsylvania Railroad.

"Under the special assignment above authorized the Eastern Superintendent of Union Line represents and acts for the General Freight Agent at all Trunk Line meetings where the General Freight Agent is unable to be present. He is to keep himself thoroughly advised in relation to all Trunk Line matters, for the information of the General Freight Agent. He also has special supervision of the Freight Soliciting Agencies in New England, and of the freight business in and out of that territory.

"The address of the Eastern Superintendent of Union Line is F. H. Kingsbury, 346 Broadway, New York.

"Freight Agents of these lines are directed to address all communications, except those relating to loss and damage claims, to the Division Freight Agents of their respective divisions. Correspondence strictly pertaining to claims for loss and damage should be addressed to the Freight Claim Agent. Claims for overcharge should be sent to the Division Freight Agents.

"Division Freight Agents are to address their general communications on freight department matters to the Assistant General Freight Agent, who, in addition to his general duties in connection with the department, will give particular attention to the local freight traffic, and to the interchangeable business with connecting lines in the territory east of Pittsburgh and Erie. The issue of all rates will be under the supervision of the Assistant General Freight Agent."

Red River, Sabine & Western.—Organized with the following officers: T. T. Lloyd, of Marshall, Tex., President; W. J. T. Evain, of Clarksville, Vice-President; F. H. Tucker, of San Augustine, Secretary, and I. H. Hollis, of San Augustine, Treasurer. Directors: E. H. Keller and S. B. Haggart, of Fort Worth; W. J. T. Evain, of Clarksville; E. C. Zeck, of San Francisco; W. E. Young, of New York; L. L. W. Lloyd, of Marshall; I. Hollis and F. H. Tucker, of San Augustine, and T. Zuckerman, of Mineola.

Rhode Island & Massachusetts.—The annual meeting of the company was held last week and directors were elected as follows: Jonathan Chase, G. L. Littlefield, Darius Goff, Ezekiah Conant, Jesse Boynton, J. P. Ray, J. G. Ray, E. K. Ray, A. B. Chace. The road is leased to the New York & New England.

Southern Pacific.—George Gerkin has been appointed General Freight Agent of the Atlantic system of the Southern Pacific, vice C. C. Gibbs, resigned. Col. Gibbs remains General Land Commissioner of the Southern Pacific.

Trinidad & Rocky Mountain.—The incorporators of this new Colorado road are: John Tipper, Wallace T. Foote, Jr., William T. H. Auburn, John R. Weeks and Charles F. Bates.

Union Pacific.—J. B. Kirkland has been appointed Passenger Agent and S. E. Eccles Freight Agent on the Pacific Coast, with office at San Francisco, vice D. W. Hitchcock, transferred.

Wellsburg, Wellsburg & State Line.—The following are the officers of the company: Samuel George, President; D. Brown, Treasurer; A. B. Paul, Secretary, with office at Wellsburg, W. Va.

OLD AND NEW ROADS.

Alabama Midland.—Work was commenced on the road last week at Bainbridge, Ga., and the first 25 miles of the road from that point will be completed by Feb. 15. When this section is finished work will commence at a point near Ada, Ala., on the Northwest & Florida, and will then be pushed from both ends of the road. It is expected to have the whole road completed by September next. J. M. Browne, of New York, has the contract.

Allegheny & Kinzua.—It is expected to have this road completed from Red House, N. Y., to Bradford, Pa., a distance of 22 miles, by Jan. 1. The track of the New York, Lake Erie & Western from Smith's Junction, Pa., to Bradford, will be used by the road.

Atlantic & Danville.—Ground was broken at Danville, Va., last week on the western division of this road, which is to be built between Danville and Clarksville, Mecklenburg County, Va., 62 miles. The Danville Construction Co. have the contract.

Baltimore & Ohio.—The stockholders at the recent annual meeting voted to guarantee two new loans, one of \$300,000 for the line from Roselle, N. J., to the Arthur Kill Bridge, and another for \$1,000,000 for the new line to shorten the connection at Philadelphia with the Philadelphia & Reading.

It is stated that the company will build a grain elevator in Philadelphia with a capacity of 1,000,000 bushels, which will cost about \$1,000,000. The company will furnish about \$600,000 of the capital and grain dealers the balance.

Bangor & Piscataquis.—The directors of the road have executed a 999 years' lease of their road to the Maine Central at an annual rental of \$12,500.

Cairo & Tennessee.—Business men of Russellville, Ky., have offered this company \$20,000 and promised to raise as much more by subscription, to run its line through that place, and the feasibility of the plan is now under consideration.

Camden & Warren.—Col. W. B. Slack, of Little Rock, Ark., and a company of surveyors last week began running a preliminary line for this proposed Arkansas road, between the terminals named. The project has remained idle for several years, but the right of way is now being bought, and a company, of which Colonel Slack is a member, will, it is stated, at once begin the work of construction.

Canadian Pacific.—It is now thought probable that the company will defer the opening of its Maine extension between Greenville and Mattawamkeag until next spring or summer. The line is open to Greenville.

Charleston, Cincinnati & Chicago.—The construction of the line from Rutherfordton, N. C., to Johnson City, Tenn., and thence to White House, Ky., will be commenced at Johnson City within 60 days. The line is now completed from Camden, S. C., to Rutherfordton, a distance of 149 miles.

Charleston & Ganley.—This road is an extension of the Kanawha & Ohio River road, and is being built from a point near Charleston, W. Va., southward up the Kanawha River. About three miles of track has now been laid, to Campbell's Creek from the Koll transfer south of Charleston. The road will be built to Walden, Kanawha County, W. Va., two miles south of Campbell's Creek, as soon as the grading is completed. The line is located as far as Kanawha Falls, but it has not yet been determined when this portion will be built. Edward N. Scott is Resident Engineer.

Chicago, St. Louis & Paducah.—A resolution of the stockholders authorizing an issue of bonds to the amount of \$1,000,000 has been filed with the Secretary of the state of Illinois. The bonds bear five per cent. interest.

Chicago & South Side Rapid Transit.—The Secretary of State of Illinois last week recorded a mortgage of the company for \$7,500,000, to secure bonds for that amount issued to raise funds for the construction of an elevated road in Chicago from Van Buren street south to Sixty-seventh street, bonds to bear interest at the rate of six per cent. The Knickerbocker Trust Co., of New York, is Trustee.

Chippewa Valley.—A mortgage for \$1,800,000 has been filed in Manistee County, Mich., made in favor of the Central Trust Co., of New York. It is on a proposed road from Mount Pleasant, Isabella County, to Manistee. The road will be about 120 miles long, and will run through Isabella, Mecosta, Newaygo, Lake, Mason and Manistee counties, and it is proposed to begin it in the early spring. Arrangements have been completed for the sale of the Manistee & Luther road to this company, and it will form a part of the contemplated new line.

Denver & Rio Grande.—The contract has been let for the construction of the branch to Lake City, Col., from Sapinero. About \$500,000 were expended upon this line six years ago, says the *Denver Republican*, and a considerable amount of earth and rock work has been done, but much more is still required. The line follows up Lake Fork, a stream largely confined to narrow and tortuous canons, necessitating considerable expensive rock work. The worst portion of the line is through the canon near the mouth of the creek, on which nothing has yet been done. This canon is eight to ten miles in length, and very rough. Rock work on this portion will be begun as soon as the necessary forces and equipments can be got upon the ground. A contract has also been let for 500,000 ties for this line.

The company is constructing a second track from Denver, 10 miles south, and for the same distance north from Pueblo; also five miles north and five south from Colorado Springs. It is expected to have the work completed by Dec. 31. This is in pursuance of the contract by which the Chicago, Kansas & Nebraska uses this road's track between the points mentioned.

Dubuque & Sioux City.—The company has moved, in the District Court at Dubuque, Ia., for a temporary injunction to restrain the Cedar Falls & Minneapolis from entering suit for rental. The petition alleges that the contract under which the Dubuque & Sioux City is operating the Cedar Falls & Minneapolis is fraudulent and void, and that should it so prove the rental paid could not be recovered because the defendant is insolvent. The claim of insolvency is the only point distinguishing this petition from the one in which some months ago the company was granted an injunction which the Supreme Court dissolved.

Eureka Railroad & Coal Co.—The company has been incorporated in California to construct a road from a point in Alameda County, eastward about 20 miles, to a point in San Joaquin County, near Stockton. The capital stock is \$2,000,000.

Farmville & Powhattan.—Fifty-five miles of the grading between Jennings' Crossing and Farmville, Va., are now completed and when the remaining nine miles are finished tracklaying will be commenced.

Gloucester City & Atco.—Chief Engineer George A. Norris, has left Gloucester, N. J., with his instruments, and has discharged his assistants. The line was projected to extend from Gloucester to Atco and is said to have been a scheme of the United States Express Company, which is now rendered useless by the settlement of certain disputes between that company and the Philadelphia & Reading Railroad.

Housatonic.—A vote was passed at the annual meeting this week in favor of amending the charter so as to carry out the plan for the purchase of the Norwalk & Danbury and other leased lines.

The company also proposes to build a line from Bridgeport east through Stratford, Huntington, Milford and Orange, and from Bridgeport west through Fairfield, Westport and Norwalk, making, if built, a road between New Haven and Norwalk, Conn., parallel to the New York, New Haven & Hartford.

Isbell & Iron Mountain.—On this short Alabama road, which is to run from Isbell, six miles to iron ore beds, the grading on the first four miles from Isbell is now completed.

Kansas City, Arkansas & New Orleans.—The company has recorded in Arkansas a mortgage for \$4,000,000 to secure bonds to that amount. This is a proposed line to extend from Beebe, Ark., to Monroe, La., a distance of about 200 miles.

Kensington.—Organized in Kansas to build a steam motor line from a point in Kansas City, Kan., to Chelsea Park, a length of 1½ miles.

Kentucky Midland.—The Home Construction Company has been organized at Frankfort, Ky., with a paid-up capital of \$200,000, to build the extensions of the Kentucky Midland from Frankfort, Ky., to the eastern end of the state, through the mountainous sections.

Lancaster & Hamden.—The contract of E. P. Buell, which we noted last week, is for building and equipping 20 miles of this road between Lancaster and Point Pleasant, O. The road is to run via Wellston and Tarlton, and the total distance is 90 miles, of which 60 miles is located. J. C. Reeves is President and P. Rising is Treasurer, both with offices in Lancaster, O.

Lehigh Valley.—The Roselle & South Plainfield road, between South Plainfield, N. J., on the Lehigh Valley, and Roselle, N. J., on the Central of New Jersey 10 miles, will soon be opened. Charles McFadden, of Philadelphia, was the contractor. The Mahoning City loop, from Mahoning City to Barrys, Pa., has also been completed. Dick & Hughes, of Harleton, Pa., were the contractors. Three miles of new road has been laid on the Poyalsock Railroad on North Mountain in Sullivan County, Pa.

Lincoln Park & Charlotte.—The contract for this new road, mentioned last week, will be let before next spring. It is to extend from a connection with the Buffalo, Rochester & Pittsburgh, near Lincoln Park, N. Y., thence north to a connection with the Rome, Watertown & Ogdensburg, near Charlotte, a distance of nine miles, with a branch to the Genesee River for coal docks.

Los Angeles & Pacific.—The extension of this California road has been completed to Santa Monica, on the Pacific Ocean, near Los Angeles.

Louisville & Nashville.—The contract for building a three-mile branch from the main line at Pineville, Ky., to the mines of the Pine Mountain Iron & Coal Co., was last week awarded to Nichols & Davison, of Pineville, Ky., and the work of grading is now in progress.

The third division of the mineral range line of the road has been turned over to the operating department. This division is 17 miles long, and extends from Middle Springs to Oneonta, Ala. The road is building at Cincinnati a new freight house, work on the foundations being well under way. The structure will be located east of the Newport & Cincinnati bridge, and will be 400 ft. long on Front street, and the width about 150 ft.

Louisville, New Orleans & Texas.—The company will, within the next six months, extend its line from Rosedale, county seat of Bolivar County, Miss., to the extreme northern limits of the county, a distance of 12 miles.

Louisville, St. Louis & Texas.—As already stated the road is now open for traffic between Louisville and Owensboro, Ky., and it is now announced that the whole line to Henderson, Ky., 142 miles, will be opened by Jan. 5. The entire line is finished, except the Green River bridge, which it is expected to have completed at the date mentioned. There are few sharp curves, and the grades are light, the maximum being 30 ft. per mile. In connection with the Louisville & Nashville the road will make a line seven miles shorter than the Ohio & Mississippi between St. Louis and Louisville, though longer by 88 miles than the Louisville, Evansville & St. Louis.

Louisville Southern.—This road was last week leased for a term of 30 years to the Louisville, New Albany & Chicago, the latter at once assuming control. The road is to be known as the Monon's "Gold Link Route." The Louisville, New Albany & Chicago guarantees the payment of the interest on the company's bonds, and pays a rental equal to the net earnings. The heads of departments will report hereafter directly to the lessees at Chicago. By this change the Louisville, New Albany & Chicago will hereafter run its trains into Louisville over the Kentucky & Indiana bridge, discontinuing the use of the Louisville bridge about Jan. 1. The lease does not affect the proposed lines of the Louisville Southern, which will be completed by the old management. Heretofore the through Southern passenger traffic of the Louisville, New Albany & Chicago has been sent over the Cincinnati, Hamilton & Dayton from Indianapolis to Cincinnati, thence south over the Cincinnati, New Orleans & Texas Pacific. This gave the "Monon" for the business obtained by it at Chicago a haul of only 183 miles (to Indianapolis). The Cincinnati, Hamilton & Dayton then hauled the train 123 miles to Cincinnati, where it was turned over to the Queen & Crescent at a transfer depot especially built for the purpose. Under the new arrangement the Louisville, New Albany & Chicago can utilize its own line from Chicago to Burgin, Ky., a distance of 405 miles, and there connect with the same road as at Cincinnati. The distance to Burgin by the new route is 7 miles shorter than by the old. The branch of the acquired road from Lawrenceburg, Ky., eastward 25 miles to Lexington, which will be finished by July 1 next, will also give a good connection with the Newport News & Mississippi Valley road for the East, and make a competing route between Louisville and Lexington. Between these points the Newport News & Mississippi Valley trains use the Louisville & Nashville track.

Lynchburg & Durham.—The company has had surveys made from Durham, N. C., south for a distance of 26 miles, and it is proposed to next year extend the road south of Durham for a considerable distance. That part of the line from Lynchburg south to Rustburg, Va., 11 miles, is now in operation. This is the heaviest part of the line and

the grading and tracklaying which has all been paid for has cost \$265,000. Work on 41 additional miles of grading is being actively pushed, and will be ready for rails by Jan. 15. A maximum gradient of 1½ per cent. on tangent is being used and there are no curves of less than 1,000 ft. radius. The roadway is 18 ft. in cuts and 14 ft. on embankments. All culverts are laid in cement, very few wooden structures are used, and the principal streams, and also one railroad, are spanned by iron bridges resting on masonry. The longest and highest bridge will cross the Staunton River, a navigable stream, and will consist of three spans 152 ft. each, resting on piers 51 ft. high. The track is laid with 56-lb. steel rails on 8½ ft. oak ties, and is now being ballasted with 9 in. of broken stone. Up to the present all work has been paid for out of cash subscriptions, and no bonds have been issued on mortgage. There is no floating debt and there is a large balance in the treasury of the company.

Maysville & Big Sandy.—It is announced that this new Ohio River Division of the Chesapeake & Ohio will be formally opened from Covington to Ashland, Ky., Dec. 24, for freight and passenger business.

Mexican Southern.—An arrangement has been made between Mr. H. Rudston Read, of the Mexican Southern, and Sr. Don Delfin Sanchez, contractor for the completion of the Inter-oceanic Railroad, that the gauge of the Mexican Southern, like that of the Inter-oceanic, shall be narrow. This will extend the narrow gauge system to the Isthmus of Tehuantepec; but before the Southern is completed the National will probably have changed its gauge from Laredo to Mexico.

Milwaukee, Lake Shore & Western.—The new line between Rhineland and Hurley, Wis., is now completed and in operation from Rhineland, northwest 27 miles, to the east side of the Flambeau Indian reservation. Five miles of track south from Hurley has also been laid. The line through the reservation, 41 miles, completing this branch, will be built next year.

Minnesota Northern.—The company expects to commence work on the road next year and grade at least 100 miles, and complete that part of it from Worthington to Tracy, Minn., a distance of 50 miles.

Missouri Pacific.—The contract for the line from Boonville eastward, about 48 miles, to Jefferson City, Mo., is reported let. Nearly all the right of way has been secured.

Monterey & Mexican Gulf.—Work is in active progress on this road, which is to extend from Monterey southward to Tampico, on the Gulf of Mexico, a distance of 325 miles, and it is expected to have the first 25 miles, from Monterey to Caderayta, completed by next February, and the whole line within two years. The road will cost about \$25,000 per mile. The company has a subsidy from the Mexican government of \$8,000 per kilometer. The New York Railway Supply Co., of New York, are the contractors.

New Roads.—A preliminary survey has been made for a road to leave the Southern Pacific at Adonde, Ariz., about 30 miles east of Yuma, and passes up the Gila River to Texas Hill. From there the survey is to be continued into Phoenix, Ariz.

New York, Lake Erie & Western.—The company has given notice to holders of the first mortgage bonds of the Newburg & New York, maturing Jan. 1, 1889, that the company has made arrangements with Messrs. Drexel, Morgan & Co., of New York, to purchase the above bonds at par, on and after maturity. The mortgage is to be extended for 40 years at 5 per cent. Of the total issue, \$166,000 are in a collateral trust, but they will be taken out of the trust by the deposit of an equal amount of collateral trust bonds purchased at 108 and accrued interest. This reduces the amount of collateral trust bonds out by the amount of \$166,000, but the extended bonds go into the hands of the general public, instead of the treasury of the company, so that, so far as the actual indebtedness of the company is concerned, there is no change.

Drexel, Morgan & Co., of New York, give notice to holders of the Jefferson Railroad (main line) 7 per cent. bonds maturing Jan. 1, 1889, that they are prepared to exchange them for new first mortgage five per cent. 20 year bonds, under a contract made with the above company. Total new issue is \$2,800,000, of which \$2,000,000 are to retire the old bonds, the balance to be used for betterments, double tracking of the road, etc.

New York & Massachusetts.—Several surveying parties are now at work in southwestern Massachusetts on the proposed line of the extension of this road from Ancram, N. Y., eastward to Chicopee, Mass. One of the parties has come across evidences of the work of the surveyors of a line made about 50 years ago for the Western Railroad, now the Boston & Albany. The line is several miles south of that finally followed by the Western.

New York & New England.—A corps of engineers in the interest of the road are surveying a line from their terminus at Hopewell Junction, N. Y., to the Poughkeepsie bridge. The distance is 10 miles.

New York, New Haven & Hartford.—President Clark stated this week at the annual meeting that the application of the company for an increase of stock would be made in indefinite terms. Mr. Clark stated that the payment of the bonded and floating debt of the company and the exchange of newly issued stock for securities of roads now leased would alone call sooner or later for some \$17,000,000 of new stock, and that an increase of the total stock to \$50,000,000 would hardly represent the amount that in coming years might have to be provided for new tracks, grade crossings and transfer securities. Hence it had been decided to leave indefinite the amount to be applied for to the Legislature.

Norfolk & Virginia Beach.—A short branch from Virginia Beach to Ocean Shore Park is now completed. Next year a line will be constructed from Princess Anne Court-house to Elizabeth Park, Va., a distance of about 25 miles. G. N. Hughes, Norfolk, Va., is superintendent.

Northern California.—The extension to Knight's Landing, Cal., is now graded beyond Yuba City to within 10 miles of the former place.

Orange County.—The contract for the construction of the road from Greycourt, N. Y., to a connection with the Pennsylvania, Poughkeepsie & Boston road, near Campbell Hall, has been let to P. P. O'Hehir, of Paterson, and John Claffey, of New York, the work to be done by June 1 next. This road will give the Central of New Jersey connection with the Poughkeepsie Bridge over the Lehigh & Hudson River road, which it now controls.

Oregon Pacific.—Trains on this road are now running to Mills City, eight miles above Mehama, the road being completed to that point. The approaches to the 400 ft. tunnel are about finished, and the work of excavating has been commenced.

Paducah & Hickman.—This proposed Kentucky road was last week voted to its capital stock \$25,000 by Clinton, Ky.; \$10,000, Moscow, Ky., and \$5,000 by Spring Hill, Ky. It is said that the work of construction will be begun early in the spring.

Paragould & Buffalo Island.—The road will soon be put in operation between Paragould, Ark., and the St. Francis River, a distance of 10 miles. Next summer five miles more will be built, including a bridge across the St. Francis River 1,000 ft. long, and three trestle bridges aggregating 3,000 ft.

Pennsylvania, Slatington & New England.—Four parties of engineers are reported at work in New Jersey surveying the route for the road from Slatington, N. J., to a connection with the Poughkeepsie Bridge.

Pittsburgh, Shenango & Lake Erie.—The Attorney-General of Dauphin County, Pa., has secured a preliminary injunction against the road, restraining the directors from issuing bonds based upon an issue of stock already distributed. It is charged that no equivalent was received for the stock, and that the issue is, therefore, fictitious and void.

Quebec Central.—The company expects to begin work early next spring on an extension from the present terminus at St. Francis, Que., to Moose River, Me., a distance of 65 miles. A. Steel, Sherbrooke, Que., is Superintendent.

Raritan River.—Tracklaying has now been nearly completed from South Amboy westward seven miles, and work is being pushed on the remaining 13 miles to New Brunswick.

Red River Sabine & Western.—The company has been organized at San Augustine, Tex., with a capital stock of \$300,000.

Richmond & Danville.—The extension from Houston west to Wilkesborough, N. C., 75 miles, has been graded to Rural Hall, on the Cape Fear & Yadkin Valley road, and grading is in progress west of that point.

Roanoke & Southern.—The grading and tracklaying is now about completed from Winston, N. C., north to Walnut Cove, a distance of 18 miles, on the Cape Fear & Yadkin Valley. Griffin & Gordon, of Yorkville, N. C., have the contract for this section. On the line from Martinsville, Va., south to the North Carolina state line, about seven miles of grading has been done. This is the heaviest part of the line. The contract for building the line from the state line to Walnut Cove will be let immediately by the Virginia & North Carolina Construction Co., of which T. H. Fries, of Salem, N. C., is president.

San Francisco & North Pacific.—The Ukiah extension of the road has been completed to Hopland. Owing to the wet weather, progress has been necessarily slow. With the heavy rains that are expected it is thought that the road will not be finished till February.

Scranton & Forest City.—A survey is now being made between Scranton and Forest City, Pa., 22 miles, for this proposed road. It is thought that the Central of New Jersey and New York, Lake Erie & Western are interested in the road.

Silver Springs, Ocala & Gulf.—The Gulf extension from Gulf Junction to Homosassa, Fla., on the Gulf of Mexico, a distance of 22 miles, will be soon opened for traffic.

Texas & Pacific.—The company has filed, at Austin, Tex., a stockholders' resolution, retiring and adjusting the present mortgage indebtedness of the company. It authorizes the issuance of \$25,000,000 five per cent. first mortgage bonds, and the same amount of second mortgage bonds.

Trinidad & Rocky Mountain.—The company has filed articles of incorporation in Colorado to construct a road from Trinidad, Col., through Las Animas, Colfax and Mora counties to Las Vegas, New Mexico. The capital stock is \$3,000,000.

Western Maryland.—On the extension of the Western Division, from Ortanna, near Gettysburg, Pa., to Blue Ridge Summit, Md., nearly five miles of track have been laid, completing the road to Fairfield, Pa.

Wheeling, Wellsburg & State Line.—The company has secured a large portion of the right of way between Wheeling, W. Va., and Pittsburgh, Pa., and after a few other preliminaries are arranged maps and profiles will be ready for the contractors. Bids for building the line have already been made, but no contract has as yet been let. The surveys are nearly completed. The road is projected to extend from Wheeling to Wellsburg and the state line, 63 miles, and the company hopes to secure \$315,000 in local aid, or \$5,000 per mile of road. Samuel George is President of the company. The general office is at Wellsburg, W. Va.

TRAFFIC AND EARNINGS.

Traffic Notes.

The Lake Shore and New York Central roads are reported badly blocked with east-bound freight. Between Erie and Buffalo last week there were 3,000 cars more than could be hauled. The blockade on the New York Central is below Albany.

A spirited local contest has been going on at Bellefonte, Pa., for some time between those favoring and those opposing a Sunday train on the Pennsylvania Railroad. The road has finally decided not to put the train on.

Emigrant rates from New York City to the West will be advanced Dec. 23 to the regular basis, \$13 to Chicago.

The Memphis & Little Rock has complained to the Interstate Commerce Commission against the East Tennessee, Virginia & Georgia and the St. Louis, Iron Mountain & Southern. Since the building of a line by the last named company, which paralleled the Memphis & Little Rock between its terminus, the East Tennessee sells through tickets to points on the line of the Iron Mountain road only over that company's line from Memphis. The complainant demands that tickets by the old as well as the new route be kept on sale.

The recent reports of serious cutting of rates on grain from Chicago eastward by means of forged way bills or transfer slips were based on certain irregularities in shipments made by Counselman & Co. over the Michigan Central. It seems to be virtually acknowledged that a large number of cars were sent by this firm and billed to the seaboard at about 18 cents per 100 lbs., the proportion from Chicago eastward of the 20-cent rate from certain points west of Chicago. The firm and the railroad company are said to have made a settlement, and the wrongful billing is attributed to a "clerical misunderstanding." Whether the deception was wholly on the part of the railroad employees or was participated in by an employee of the firm does not clearly appear.

The plan of issuing joint passenger rate sheets quarterly instead of monthly has been agreed to by 170 roads in Central Traffic Association territory.

Rates on live stock and meats from Kansas City and other

Missouri River points to Chicago, which are the only freight rates now seriously demoralized in that territory, will not be restored Jan. 1, as had been expected. Some of the lines have contracts at low rates which extend to Jan. 15.

Nothing effectual has been done toward restoring passenger rates between Chicago and Kansas City.

Vice-Chairman George H. Daniels, of the Central Traffic Association, proposes that the Chicago roads unite in vigorously prosecuting ticket brokers of that city, whose business is unlawful under the statutes of the state of Illinois. There is said to be a determined effort to bring about concerted action in the matter.

The Chicago ticket brokers, who have received from certain Southwestern roads large blocks of tickets to be sold on a heavy commission, have placed some of the tickets with other brokers in Eastern cities.

The Kansas City, Fort Scott & Memphis announces a series of winter excursions to Florida points. They start from Kansas City Dec. 18, Jan. 15 and 29 and Feb. 12 and 26.

The roads interested in Colorado and Utah traffic will organize the lines east and west of the Missouri River into one association. All rates were restored last week except on lumber, iron and stoves, which will not be advanced until Jan. 1.

All the Chicago-St. Paul lines will advance passenger rates Dec. 24 to the basis of \$11.50 first-class, and \$9 second class. This is a restoration of the rates in existence before the rate war broke out, and is to apply in both directions.

Eighty-five car loads of Utah potatoes have been shipped to Texas points over the "Texas Pan-Handle" route in the last sixty days.

Demurrage at Chicago.

The hardwood lumber dealers of Chicago continue to discuss their troubles in connection with the new rules of the railroads regarding unloading of cars in that city. At a meeting, reported in the last issue of the *Northwestern Lumberman*, a prominent member of the association stated that the order of the Car Service Association came to him without warning, when he had 60 cars on the track to unload, some of which had been on the road 40 days. He complained of various instances of poor service by the railroads. His firm had lost \$50 on one shipment that was six weeks in transit. Another of two cars started Oct. 1 and the bill on it was paid Nov. 30, but the cars had not yet arrived on his track. His losses on delays of delivery of lumber would amount to \$1,500 a year. During the Burlington strike last spring his firm, as well as others, lost many hundred dollars by delays in lumber shipments, and now the Burlington road turns around and joins this association. He had ordered shipments stopped until the question could be settled. The speaker, together with another firm, cited by him, had refused to receive notices or to pay demurrage, and they had put in claims for damages for delay during the past eight months. The sentiment of the speakers at the meeting, of whom there were only three or four, seemed to be that, with a somewhat longer notice, they could comply with the new rules. One demand was for 72 hours after arrival for notice and 72 beyond that for unloading, making six days in all. Others were more moderate in their demands. The *Lumberman* states that appeals to Chairman Moore are unavailing. He says that he can do nothing but enforce the order until it is rescinded, and that the roads will enforce the 48-hour rule until it has had a fair trial. The individual roads will listen to no requests, says the *Lumberman*. The meeting referred to, which seems to have been very slimly attended, appointed a committee of three to stir up the lumber dealers with a view to securing united action; first to persuade the roads to concede more time, or, failing that, to resort to the courts. There was considerable talk about the legal rights of consignees, but their chief ground seems to have been the instances of slow time made by the roads. Nothing is said about the replies of Mr. Moore or of the railroads on this point.

Switching Charges at Kansas City.

Commencing Jan. 1 the charges for switching loaded cars at the Kansas City stock yards will be \$2 per car instead of \$1.50 as heretofore. Another charge of 50 cents per car will be made for weighing stock that goes into the yards. The charge for switching loaded cars to and from the Belt Line, Kansas City, will be \$2 per car instead of \$1 as heretofore. The cause given is the increase of the wages of switchmen and in the sizes of cars, which make the expense per car nearly double what it was two years ago. The charge for weighing stock includes the weighing of empty cars back.

Iowa Rates.

Twenty-four suits have been entered in the District Court at Davenport against the Chicago, Rock Island & Pacific by Attorney-General Baker, charging extortionate freight rates. The writs ask \$5,000 damages on each of the 24 suits.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Dec. 15, amounted to 108,891 tons, against 93,391 tons during the preceding week, an increase of 15,500 tons, and against 50,062 tons during the corresponding week of 1887, an increase of 58,829 tons. The proportions were:

	Wk to Dec. 8.		Wk to Dec. 15.	
	Tons.	P. c.	Tons.	P. c.
Wabash.....	7,544	8.1	7,327	6.7
Michigan Central.....	11,513	12.3	13,676	12.6
Lake Shore & Mich. So.....	13,379	14.6	15,922	14.6
Pittsburgh, W. & Chicago.....	10,570	11.3	11,438	10.5
Chicago, St. L. & Pittsburgh.....	7,296	7.8	10,236	9.4
Baltimore & Ohio.....	8,063	8.6	9,599	8.8
Chicago & Grand Trunk.....	18,093	19.4	17,105	15.7
N. Y., Chicago & St. Louis.....	7,380	7.9	10,997	10.1
Chicago & Atlantic.....	9,353	10.0	12,611	11.6
Total.....	93,391	100.0	108,891	100.0

Of the above shipments 4,534 tons were flour, 68,594 tons grain, 3,356 tons millstuffs, 6,077 tons cured meats, 4,593 tons lard, 8,088 tons dressed beef, 1,886 tons flaxseed, 792 tons butter, 1,886 tons hides, 414 tons wool, and 3,414 tons lumber.

The three Vanderbilt lines together carried 37.3 per cent., while the two Pennsylvania lines secured 19.9 per cent. The shipments for the week ending Dec. 8 were the heaviest on record up to that time, but the present record it will be seen is still higher. No less than 50,982 tons of corn were shipped, or nearly 50 per cent. of the week's business. The enormous corn crop of the present year, together with the anxiety of shippers to take advantage of the low tariff, expiring Dec. 16, account for the large movement. Reports from Cincinnati and other points indicate a similar increase in east-bound shipments, and the New York Central has had more cars than it could haul.

Anthracite Coal Tonnage.

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, has issued the following statement of anthracite coal tonnage for the month of November, 1888, and the year to Nov. 30, as compared with same period last year:

Month of November:		1888.	1887.	Inc. or Dec.
Phila. & Reading.....		845,065	788,608	I. 56,457
Lehigh Valley.....		690,264	307,526	I. 262,737
Central of N. J.....		535,455	427,473	I. 107,982
Del., Lack. & W.....		963,847	717,542	D. 246,305
Del. & Hud. Canal Co.....		410,425	444,587	D. 34,162
Pennsylvania.....		371,002	366,528	I. 4,473
Pennsylvania Coal Co.....		134,821	177,374	D. 42,553
N. Y., L. E. & W.....		97,773	66,552	I. 31,221
Total.....		3,718,652	3,386,190	I. 332,462
From Wyoming Region.....		1,932,029	2,236,927	D. 284,898
Lehigh.....		1,601,893	27,936	I. 573,957
Schuylkill.....		1,164,729	1,212,326	I. 43,403
Eleven months to Nov. 30:		1888.	1887.	Inc. or Dec.
Phila. & Reading.....		6,707,096	6,936,947	D. 229,851
Lehigh Valley.....		6,110,617	5,427,804	I. 682,813
Central of N. J.....		5,295,692	4,470,412	I. 825,280
Del., Lack. & West.....		6,463,756	5,495,107	I. 968,649
Del. & Hud. Canal Co.....		4,139,683	3,630,529	I. 509,154
Pennsylvania.....		4,287,360	3,464,930	I. 822,430
Pennsylvania Coal Co.....		1,551,596	1,451,722	I. 99,874
N. Y., L. E. & W.....		885,983	695,457	I. 190,526
Total.....		35,441,795	31,572,939	I. 3,868,856
From Wyoming Region.....		20,327,787	17,539,701	I. 2,788,086
Lehigh.....		15,120,062	4,310,551	I. 809,511
Schuylkill.....		9,995,946	9,722,687	I. 273,259

The stock of coal on hand at tide-water shipping points Nov. 30, 1888, was 569,233 tons; on Oct. 31, 1888, 359,133 tons; an increase of 210,100 tons.

This statement includes the entire production of anthracite coal, excepting that consumed by employees, and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective roads, adjustment being necessary in the compilation to avoid duplications, etc.

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending Dec. 1, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Dec. 8.....	249,610	98,653	348,263
Total for year 1888 to date.....	10,952,473	3,851,060	14,803,533
Total for year 1887 to date.....	9,723,693	3,488,186	13,211,879

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey dividers for the same periods was as follows:

	1888.	1887.	Inc. or Dec.
Total for week.....	35,694	45,238	D. 9,544
Total for year.....	1,578,184	1,470,021	I. 108,163

The coal tonnages for the week ending Dec. 15 are reported as follows, in tons:

	1888.	1887.	Decrease.	P. c.
Anthracite.....	688,859	777,518	88,659	12.4
Bituminous.....	373,512	378,421	4,909	1.3

The Cumberland coal trade for the week ending Dec. 15 amounted to 69,909 tons, and for the year to that date, 3,465,484 tons.

Railroad Earnings.

KNOXVILLE & OHIO.

Month of October :		1888.	1887.	Inc. or Dec.	
Gross earnings.....	\$45,304	\$49,112	D.	\$3,808	
Oper. expenses.....	24,665	29,277	D.	4,612	
Net earnings.....	\$20,638	\$19,835	I.	\$803	
July 1 to Oct. 31:					
Gross earnings.....	\$165,990	\$173,546	D.	\$7,556	
Oper. expenses.....	120,694	104,158	I.	16,536	
Net earnings.....	\$45,295	\$69,388	D.	\$24,093	

OREGON SHORT LINE.

Month of October :					
Gross earnings.....	\$288,485	\$171,567	I.	\$116,917	
Oper. expenses.....	139,578	106,614	I.	32,964	
Net earnings.....	\$148,906	\$64,953	I.	\$83,952	

EAST TENNESSEE, VIRGINIA & GEORGIA.

Month of October :					
Gross earnings.....	\$501,854	\$509,907	D.	\$8,053	
Oper. expenses.....	293,030	308,712	D.	15,682	
Net earnings.....	\$208,823	\$201,195	I.	\$7,628	
July 1 to Oct. 31 :					
Gross earnings.....	\$1,771,516	\$1,759,716	I.	\$11,800	
Oper. expenses.....	1,164,864	1,112,566	I.	52,298	
Net earnings.....	\$606,651	\$647,150	I.	\$40,499	

Earnings of railroad lines for various periods are reported as follows:

Month of October:		1888.		1887.		Inc. or Dec.		P. c.	
Bur., Ced. Rap. & N.....	\$330,856	\$319,088	I.	\$11,768	3.5				
Net.....	146,824	161,830	D.	15,006	9.2				
Central of Iowa.....	141,900	128,672	I.	13,228	10.3				
Net.....	10,924	37,481	D.	26,557	70.8				
Chesapeake & Ohio.....	338,787	472,349	D.	133,562	4.5				
Net.....	123,832	123,482	I.	350	0.3				
*Ches., Ohio & So. W.....	204,907	222,728	D.	17,821	8.0				
Net.....	88,734	116,011	D.	27,277	23.5				
Chi., Bur. & No.....	248,614	192,888	I.	55,726	28.9				
Net.....	100,437	52,072	I.	48,365	92.8				
East Tenn., Va. & G.....	550,967	555,212	D.	4,245	0.8				
Net.....	228,658	221,834	I.	6,824	3.1				
Kentucky Central.....	108,000	104,797	I.	3,203	3.0				
Net.....	65,452	45,512	I.	19,940	45.8				
Knoxville & Ohio.....	49,113	45,304	D.	3,809	43.8				
Net.....	19,835	20,639	D.	804	4.1				
Mil., L. Sh. & West.....	309,455	293,310	I.	16,145	5.5				
Net.....	140,178	93,928	I.	46,250	49.3				
Minn. & St. Louis.....	143,340	146,017	D.	2,677	18.3				
Net.....	46,261	46,362	D.	101	0.2				
New Brunswick.....	39,518	36,974	D.	2,544	6.9				
Net.....	32,188	40,608	D.	8,420	26.2				
Ohio River.....	48,728	46,023	I.	2,705	5.9				
Net.....	24,373	27,357	D.	2,984	10.9				
Omaha & St. Louis.....	42,359	41,168	I.	1,191	2.9				
Net.....	11,741	11,983	D.	242	2.0				
Ore. Improve. Co.....	397,191	431,819	D.	34,628	8.0				
Net.....	68,429	106,137	D.	37,708	58.8				
Ore. Ry. & Nav. Co.....	731,719	615,046	I.	116,673	19.0				
Net.....	328,665	369,607	D.	37,942	10.3				
Rome, W. & Ogd.....	322,349	316,802	I.	5,547	1.7				
Net.....	157,240	164,560	D.	7,320	4.4				
Southern Pac. Co.....									
Gal., Har. & S. Ant.....	315,138	355,540	D.	40,402	11.4				
Net.....	81,626	132,420	D.	50,794	38.3				
Louisiana West.....	95,740	81,198	I.	14,542	17.9				
Net.....	51,474	46,136	I.	5,338	11.6				
Morgan's La. & Tex.....	537,888	554,115	D.	16,227	3.0				
Net.....	229,477	239,618	D.	10,141	4.3				
N. Y., Tex. & Mex.....	18,475	16,633	I.	1,842	11.1				
Net.....	2,896	4,019	D.	1,123	28.1				
Tex. & N. Orleans.....	134,050	122,125	I.	11,925	9.8				
Net.....	44,586	59,346	D.	14,760	24.4				
Tit. Atlan. System.....	1,101,069	1,129,611	D.	28,542	2.5				
Net.....	410,539	431,530	D.	20,991	5.1				
Wabash.....	680,280	679,753	I.	527	0.1				
Net.....	163,449	176,920	D.	13,471	7.6				

Month of November:		1888.		1887.		Inc. or Dec.		P. c.	
Atlantic & Pacific.....	\$303,481	\$293,481	I.	\$10,000	28.9				
Bur., Roch. & Pitts.....	171,985	185,919	D.	13,934	6.1				
Bur., Ced. Rap. & N.....	270,153	299,589	D.	29,436	9.8				
Cairo, Vin. & Chic.....	65,745	67,488	D.	1,743	2.6				